The MINING CONGRESS JOURNAL

Volume 10 JULY, 1924 *No.* 7

IN THIS ISSUE

Actual Experiences in Applying Rock Dust

Coal Dust—Occurrence, Characteristics and Behavior

Rock Dusting and Explosion Prevention

Efficacy, Methods and Cost of Rock Dusting

Rock Dust Versus Water

Research in Blasting Coal

Lump Coal and Better Blasting Methods

Cushioned Blasting Increases Lump Coal Production

Testing Methods of Blasting Coal

West Virginia's Problem in Industrial Cooperation

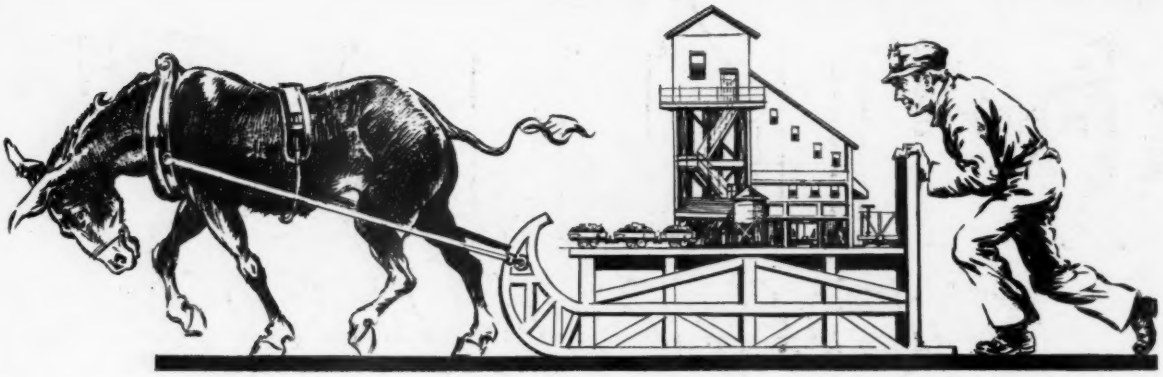
One Way of Reducing Operating Costs

Education of a Mining Engineer

Legislative Review

Contributors:

J. E. Jones, J. W. Paul, Geo. S. Rice, John T. Ryan, Edward Steidle, C. H. Matthews, S. J. Kidder, Josiah Keeley, Bert Hews, Harold Tallon, Geo. H. Cushing, J. E. Crawshaw, H. C. Adams, J. H. Horlick, Jr., J. E. Tiffany, C. W. Nelson, Victor C. Alderson.



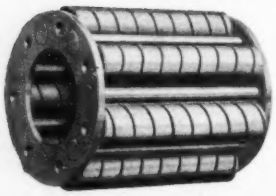
Hard Sledding For High Cost Mines

HIGH cost mines are bound to have hard sledding during the next few years. Mines producing low cost coal are going to control the market.

One way to cut high costs and to get into the profit making low cost class is to be sure that your haulage, lubrication and mine car truck repairs and maintenance are kept at the lowest possible figure.

In hundreds of mines the successful performance of Hyatt equipped mine cars is convincing operating men that the best equipment is the cheapest in the long run. Hyatt bearing mine car trucks require no attention other than an occasional greasing—they are durable and dependable.

Most of the reputable mine car manufacturers furnish Hyatt bearing cars and trucks. If you tell them you want easy rolling economical mine cars they will recommend their standard Hyatt equipment.



HYATT ROLLER BEARING COMPANY

NEWARK HUNTINGTON PITTSBURGH CHICAGO
WORCESTER PHILADELPHIA DETROIT SAN FRANCISCO
BUFFALO CLEVELAND MILWAUKEE MINNEAPOLIS

弊社が現に諸彦に提供しつゝある格安の下級（アエロ、ブランド、シヤイナイド）は之を絶へず有効に使用して一噸に付約十五錢の節約が出來た經濟品であります

THE MINING CONGRESS JOURNAL

JULY, 1924

CONTENTS

$3.00 Per Year
30c Per Copy

Page

Editorials

Our Government 285
The Gold Miners' Future 285
Unable to Compete 286
High Taxes to Prevent War 286
Breaking Faith with Taxpayers 286
Unjust and Unintelligent Criticism 287
Dangerous Legislative Ethics 287
Transportation Allowed Respite 288
Rock Dusting 288
A Word in Justice 288

Feature Articles

Security Holders and the Revenue Act of 1924—By McK. W. Kriegh 289
Actual Experiences With and Tried Methods Of Applying Rock Dust—By J. E. Jones 291
Occurrence, Characteristics and Behavior of Coal Dust—By J. W. Paul 294
Investigations Into Rock Dusting for Coal Dust Explosion Prevention—By Geo. S. Rice 295
Rock Dusting of Coal Mines: Efficacy, Methods, and Costs—By John T. Ryan 297
Rock Dust versus Water as a Preventive Measure for Mine Explosions—By Edward Steidle 298
One Way Of Reducing Operating Costs—By C. H. Matthews 299
The Education of a Mining Engineer—By S. J. Kidder .. 301
West Virginia's Problem in Industrial Cooperation—By Josiah Keeley 303
Board Of Governors, Western Division, Meet—By Bert F. Hews 305
Amador County—Home of Big Gold Mine—By Harold Tallon 317
Coal Association Growing Pains—By George H. Cushing 318
Research in Blasting Coal—By J. E. Crawshaw 327
Lump Coal and Better Blasting Methods—By H. C. Adams 328
Increasing Lump Coal Production by Cushioned Blasting—By J. H. Horlick, Jr. 329
Procedure of Making Tests to Determine the Efficiency of Different Methods of Blasting Coal—By J. E. Tiffany and C. W. Nelson 330
Oil Shale in the United States—By Victor C. Alderson .. 331

Page

News

Permissible Storage Battery Locomotives 300
Explosion Hazards of Pulverized Coal 300
Coal Storage Cuts Price 300
Oil Shale Bibliography 304
Transportation Act Survives Congressional Proposals... 310
Dry Cleaning Process for Coal 311
Coal Cleaning Studies 314
Greater Safety in Mining Discussed 315
Ohio Coal Markets 320
Legislative Review 321
Technical Divisions Rearranged 326
Coal Mine Sampling 328
"Pittsburgh Plus" Hearing Before Trade Commission... 332
Natural Resource Industries Analyze Common Problems 333

Illustrations

"Long" Bridge Across the Potomac at Washington...Insert
Blower Rock Dusting Machine 291
Rock Dusting in the U. S. Bureau of Mines Experimental Mine 291
J. W. Paul 294
Rock Dusting, Talk O' Th' Hill Collieries, England 294
George S. Rice 295
Lighting Effect of Blowing White Dust 295
John T. Ryan 297
Edward Steidle 298
C. H. Matthews 299
S. J. Kidder 301
Robert F. Tally 305
A. G. Mackenzie 305
Emmett D. Boyle 307
George A. Stahl 309
Outside View of Wyoming Coal Co.'s Air Cleaning Plant 311
American Pneumatic Separator 313
Contrasting Methods of Placer Mining 317

Published Every Month by the American Mining Congress, Washington, D. C.

JAMES F. CALLBREATH
Editor-in-Chief

E. R. COOMBES
Managing Editor

MCKINLEY W. KRIEGH
Assistant Editor

HERBERT WILSON SMITH
Associate Editor

ERNEST H. PULLMAN
Legislative Editor

F. E. PRIOR
Art Editor

E. C. PORTER
Advertising and Business Manager

L. R. HUDSON
M. B. HERBERT
Field Representatives

Entered as Second Class Mail Matter January 30, 1915, at the Post Office at Washington, D. C.

An Outline for a Na

Plank 1. Financing Mining Enterprises

Every intelligent mining man is opposed to the misrepresentation of the facts in regard to mining properties. But for the last decade, the investment of funds by the public and by financial houses in mining ventures has been so hampered as to make development of mining properties difficult and frequently impossible. The mining industry is a great national asset. It should be encouraged and utilized fully.

Plank 2. Federal and State Taxation

During the last ten years there has been an oppressive increase in the levies by the National Government, by the States and by the smaller communities in the taxation of mining enterprises. The continuance of this burden in view of the exceptional risks which must be accepted in all mining enterprises will, if continued, result in a definite decrease in mining production. The mining industry should not be penalized by unjust taxation.

Plank 3. Industrial Relations

No topic is of more importance to the mining industry than the question of developing better relationships between the employers and employes in various mining enterprises. Many companies have been notably successful in creating conditions which have developed a greater degree of confidence and mutual good will. Their success should be made universal.

Plank 4. Government Paternalism

The United States of America was founded upon individual initiative. Probably the greatest danger confronting this country lies in the tendency on the part of both the national and state governments to constantly increase their regulation and restriction of individual incentive and initiative. The mining industry needs cooperation—not confiscation.

Plank 5. A Tariff On Minerals

Tariff on minerals with particular reference to lead, zinc, manganese, magnesite, tungsten and all other essential minerals, have saved these industries to the country, bringing prosperity where mines were abandoned. A continuance of this prosperity is highly desirable.

These subjects, and many others will disc

of The Americ Mi

SACRAMENTO, CALIF.,

Mr. Mining Man, it should you

to assist in t form

A Nation Mi

Na onal Mining Platform

Plank 6. Cost Reduction—Practical Problems

The Standardization Division has worked steadily for four years making recommendations for the reduction of operating costs—the elimination of waste and economy in methods. No greater assistance to the industry can be given than elimination of waste and cost reduction in methods.

Plank 7. Gold

The great gold reserves in the United States resulting from the importations of gold to this country during and after the war present an abnormal situation; with the restoration of normal conditions, the bulk of these gold reserves will gradually move back to other countries as a basis for the establishment of sound currency. Unless virgin gold production in the United States is maintained and developed, this country might well during the next ten years face a very serious situation which would of necessity bring about disastrous conditions in the industrial and commercial structure of this country. Our gold standard must be protected.

Plank 8. Silver

Nothing could be of greater value to the restoration of normal conditions in commercial transactions in Europe than the reintroduction of silver as a basis for subsidiary coins. This is a problem of international importance. It affects the life and interest of everyone engaged in industrial and commercial business.

Plank 9. The Coal Industry

A feature of the Sacramento meeting will be the presentation of the point of view of representative leaders of the coal mining industry of the problems confronting that important phase of mining. The cooperative effort of all phases of the mining industry is essential in order to establish a basis for continued and prosperous development.

will discussed at the 27th Annual Convention
neric Mining Congress

SEPTEMBER 29 - OCT. 4

ould your pleasure, it is your duty
t in formation of
tion Mining Platform

The

MINING CONGRESS JOURNAL

PUBLISHED EACH MONTH BY THE AMERICAN MINING CONGRESS MUNSEY BLDG., WASHINGTON, D. C.

Subscription Rate, per Year, $3.00 Single Copies, $0 30

VOLUME 10 JULY, 1924 NUMBER 7

OUR GOVERNMENT

AMERICAN citizens love their Government. Professional agitators may agitate against the institutions of the Government; preachers of communism may preach their vicious doctrines; disappointed politicians may cry in vain against the political system under which the nation has thrived; perverters of justice may seek to substitute mob rule for the orderly procedure of the courts; selfish political minorities may strive to overrule the will of majorities by malicious propaganda and carefully planned campaigns of misrepresentation; but the American people will continue to have faith in their Constitution under which they enjoy civil and religious rights and privileges not granted by any other government to its people. And as long as the Constitution stands, the Government of the United States will live.

A national oratorical contest, in which youthful high school students all over the country participated, had its grand finale recently in the Memorial Continental Hall at the national capital. The contest was on the Constitution. The final contest was staged in the presence of justices of the Supreme Court of the United States and was heard by a radio audience of more than a million people throughout the nation. President Coolidge presided. Don Tyler, Los Angeles high school student, won first prize, and Ruth Newburn, Washington, D. C., high school student, won second. These two were representative of the fine young manhood and womanhood of the nation who will carry on when the present generation of citizenry begins to feel the weight of years. The sound, logical, intelligent and impressive presentations of arguments and declarations of principles by these and other contestants show how deeply rooted is the confidence of the people of the United States in their Government. The faith and ideals of youth reflect the abiding faith and ideals of their elders.

Of course, there are small groups of citizens in free America who have no reverence for the Constitution, who feel no patriotic thrill when the national anthem is played, and who acknowledge no duty or responsibility to the Government, either in time of peace or of war, as an obligation of citizenship. For them, the red banner of Moscow has greater significance than the cherished institutions of the United States. Yet, such enjoy the protection afforded by the Constitution. They are permitted to live and move and profit unmolested. And, after all, the American people would rather tolerate such minorities and permit their destructive preachments to be spread throughout the land than to attempt to circumscribe the liberties accorded under the Constitution. The lovers of free America and its institutions do not fear the preachments of the few whose minds are warped and whose conduct is misguided. As long as the supreme power of government rests in the hands of the governed, our Government will be administered according to the wishes of the people, and all classes, both majority and minority, will have a part in the management of its affairs.

THE GOLD MINERS' FUTURE

THE present general recognition by all authorities economic and otherwise that the United States possesses more than two billion dollars in gold in excess of the reserve she can safely use as a basis of credit or retain with profit, is a justification of recent editorials in the MINING CONGRESS JOURNAL.

The growing belief that Germany is stronger industrially than ever in her history is also in line with similar expressions made shortly following the armistice and at a time when many of our citizens were expressing sympathy with Germany's pretention that she could not meet the payments required by the report of the Reparations Commission.

The Dawes Commission brought the truth from its hiding, showing the means by which Germany has paid her internal debts in worthless marks, which is but another expression of repudiation. With her industrial machinery intact she lacks only exchange machinery, money, to quickly rebuild her fortunes through payment in kind of her reparations obligations. This will make the inroads of German manufactured products a menace to our markets which will stagger those who now insist that the next session of Congress will witness a downward revision of our tariff rates.

The complete acceptance of the recommendations of the Dawes Commission will undoubtedly mark the beginning of an important gold export movement. This will in the not far distant future provide the life blood of commerce to many countries who will then be able to take our surplus goods to the immense advantage of both.

The U. S. Department of Commerce set forth that even with a continuing merchandise export surplus that the so-called invisible item of international trade left a net balance against us of $488,000,000 in 1922 and $152,000,000 in 1923.

We must not ignore the fact that business conditions may flourish with a balance of trade against us; we manufacture many goods part of which must be exported if business is to be on a satisfactory basis; other goods we make only part are required to supply domestic needs and that still other of our necessities must be imported.

The export movement of gold is now beginning. A London dispatch states that more than $100,000,000 from New York has recently passed through London to India and that other large shipments of gold by English bankers were in progress.

Some day our economic and financial experts will awaken to the further truth that when this trend of affairs has been consummated that the gold reserves remaining in this country will be severely taxed to

support the increased volume of credit money and to maintain our credit. When that time arrives, and it is not so very far distant, others beside the owners of gold mines will become interested in the stimulation of gold production.

The great fundamental purpose of the Federal Reserve Banking System which met universal approval was that it was able to protect any solvent national bank against a run which might ruin the most stable of banks. The exercise of this power of temporary local inflation furnished time for any solvent bank to meet demands and protect itself. The mere knowledge that such power exists is a substantial protection. But with all its potency it must still be recognized that a proper gold reserve is an essential without which it could not function in a time of general stringency.

A comprehensive gold export movement will awaken the public mind to the fact that a proper and equitable distribution of the world's gold will leave no country with an undesirable gold surplus.

The gold mine owner has waited a long time but sooner or later he will come into his own.

UNABLE TO COMPETE

ONE of the most aggressive partisans of the coal industry is on record with a statement, the substance of which is:

"Coal is now but one of three sources of heat and power. Coal is the only one of the three which moves by rail. The rail rates are constantly increasing; the cost of transporting or transmitting the other two is constantly decreasing. With coal rates rising and having a tendency toward a fixed increase of carrying charges with each additional mile traveled and without the other carrying charges being so definitely measured, coal is, by this process, being gradually and forcefully eliminated from the market."

The statement is obviously intended as a violent arraignment of the whole scheme of regulation which confines one thing to a fixed rule of conduct without being able to control, in similar fashion, the conduct of its competing commodities. The obvious purpose of the statement is to show the fallacy of the whole regulation idea. But the more immediate purpose is to arouse in the coal industry a sense of the tremendous importance which freights play upon the sale of the commodity.

While there is great merit in the foundation of the whole thesis, it is unfortunate that the information is not available upon which to judge the correctness of the statement itself. If you proceed on logic alone, it is obvious, as this writer says, that when the carrying charges on one commodity are steadily rising and when the carrying charges on a competing commodity are declining, the commodity which must pay the high rate of carriage simply cannot compete.

And, it seems to be true that the rates on coal are steadily increasing. It also seems to be true that the rates on the competing sources of heat and power are constantly decreasing. Thus it seems to be true that the coal industry should be—if it isn't—losing business.

But we are stopped short at the door of plausible theory by the absence of any concrete information. The writer in question says that the bituminous industry has lost one hundred million tons of business in the last eight years. Before that statement can be made with any positiveness, we should know how much business ought to have been done, now, had things gone on in their normal way. We have no such information. At any rate, the writer's statements are sufficiently strong to warrant their being investigated to demonstrate to a finality whether they are even reasonably accurate. If they prove to be correct, the coal industry has a powerful case at the court of public opinion.

HIGH TAXES TO PREVENT WAR

THERE seems to be little hope for any substantial reduction in taxes for many years to come. Already an alarming percent of our people are on the Government payroll. The administration of the Adjusted Compensation Bill will require a substantial army. If Senator Oddie's conclusions concerning the Veterans Bureau are correct, as they apparently are, we need another small army to watch those who are called upon to administer these laws.

Years ago Dr. David Starr Jordan, then President of Leland Stanford University, published a book giving a mathematical demonstration that a great war between any two of the stronger nations was impossible because of the impossibility of raising money enough to finance such operations. Senator Brookhart, of Iowa, seems to share the same general idea. He regards the bonus victory as "really a great victory of genuine Americanism over the sordid principles of dollar-a-year capitalism." The Senator also regards the expenditure of public money as a potent cure for war and says "the lovers of peace also should rejoice, because there is no cure for war so potent as to compel those who profit out of war to pay for it. I hope it will be the forerunner of a liberal pension system *that will strip the war fortunes of all their illgotten gains.*"

The public will always approve and willingly pay whatever tax may be necessary to do full justice to its soldiers, but it will hardly approve a plan to so impoverish the country by taxing it for unnecessary purposes that it will be unable to defend itself against possible encroachments upon its liberties as a nation.

BREAKING FAITH WITH TAXPAYERS

WHILE the question of revenue revision was pending in Congress, taxpayers were led to believe that the fixing of rates was the most important issue involved. Taxpayers generally paid little attention to the important, technical and complicated administrative provisions, which Congress, the Treasury Department and the Tax Simplification Board had said should be simplified. Consequently, several new administrative provisions were written into the revenue laws from which trouble and expensive litigation are sure to develop. These new administrative provisions were formulated for the purpose of securing the exaction of additional taxes from certain classes of taxpayers. They apply not only to transactions of the future, but to transactions of the past. In the cases where they apply retroactively to transactions that have been consummated in the past, they constitute a breaking of faith with the taxpayers. Many past transactions, made in accordance with the then existing revenue laws, and in compliance with Treasury rulings and regulations, will now result in additional taxes for the future under section 204, subdivision (a). Paragraphs 7 and 8 of this subdivision are particularly vicious in their retroactive effect. Investors and security holders who have purchased stock in reorganized companies may find that the provisions of these paragraphs will prevent the return of their capital investment through proper depreciation and depletion allowances, although at the time they purchased the stock or securities of the reorganized companies, the bases for depreciation and depletion allowances equalled the cost of such stock or

securities. With these bases arbitrarily reduced by law, the security holders in reorganized companies affected by these provisions will find themselves taxed upon their capital as it is returned as well as upon that part of their income which represents true taxable profit. Such provisions of law are unconscionable and can not be justified by any process of reasoning.

UNJUST AND UNINTELLIGENT CRITICISM

WE have the right to expect intelligent and accurate presentation of legislative questions by the *Washington Post*. When the *Post* quotes the following editorial from the *Kansas City Times*, it becomes more guilty than the original source. The law requiring the repurchase, at one dollar per ounce, of silver already disposed of by the Treasury at one dollar per ounce, cannot be confused with or termed a bonus to any one from any one.

When the *Kansas City Times* states—

> "Under the Pittman bill the Treasury must buy from the silver producers some 14,000,000 ounces of silver which producers do not want to keep, and pay them $1.00 an ounce for it. Of course, it's worth only 66 cents an ounce, and anybody except the Government can buy it for that, but under the bonus principle now so well established in Government it is recognized that producers who produce more of anything than the market can absorb can demand that the Government take it off their hands at a higher price than anybody else will pay for it.
>
> "Thus does the bonus principle in Government march on. When the silver producers have unloaded it will be the turn of some other industry that finds itself overstocked. Ultimately the Government will be able to open up a general merchandise store and do a good business selling things at considerably less than it paid for them."

it not only shows its incompetency to pass upon this national question, but does a great injustice to this industry.

The MINING CONGRESS JOURNAL has frequently explained the reasons for this legislation, which directs the Treasury to purchase 14,000,000 ounces of silver from American producers at $1 per ounce under the original Pittman act of 1918. The Pittman act authorized the conversion into silver bullion of 300,000,000 standard silver dollars, and their replacement by purchases of silver from American producers at $1 per ounce. These transactions were authorized during the war when silver was selling at more than $1 per ounce, the maximum at one time being $1.35 per ounce. England needed the silver for its trade with India and the American market was the only place where it could be obtained.

During the time that silver was being purchased by the Mint to replace these standard silver dollars, the Treasury ordered some of the silver to be coined into subsidiary coinage and directed that silver so used should be charged against the Pittman silver account and proportionate amounts of new silver purchased. Shortly before the completion of purchases of silver under the Pittman act, the Treasury, without any public notice, had these silver allocations for subsidiary coinage revoked, which had the effect of reducing by some 14,000,000 ounces the amount of silver which the Government should have purchased in completing transactions under this act. The fact that such silver had been used for subsidiary coinage without replacement by additional purchases was not made known by the Government until several weeks before purchases under the act were terminated.

Then followed an investigation of the matter by the Senate commission on gold and silver inquiry, Senator Pittman of Nevada, author of the original Pittman act as chairman of the subcommittee having charge. Considerable testimony was taken by the commission which proved that the silver from Pittman act purchases was used in coining subsidiary currency, and extensive correspondence was exchanged between Senator Pittman and officials of the Treasury Department who, however, refused to yield on their contention that the Treasury was within its right in using this silver and not replacing it by additional purchases. Senator Pittman then introduced and the Senate passed a bill directing the Treasury to purchase the additional 14,000,000 ounces in order that the letter and spirit of the original Pittman act should be complied with. The bill was carefully considered by the Senate Committee on Banking and Currency, unanimously reported by it, and passed the Senate without debate or even a dissenting vote. The bill was received by the House too late in the session which just closed to permit action by that body. It is pending in the House Committee on Banking and Currency and is likely to be favorably considered by that committee and the House at the next session, as the bill will retain its status until March 4, 1925.

This, then, definitely disposes of the ignorant "bonus" epithet. Instead of being a bonus it is merely a matter of common decency and national honor in meeting an obligation incurred.

DANGEROUS LEGISLATIVE ETHICS

THE passage of the Bonus Bill by the Senate of the United States calls public attention to an extremely bad habit which in these days of "Blocs" and aggressive minorities is becoming dangerous.

It is understood that a number of senators voted for the bill because of a promise which they felt could not be consistently ignored.

Without reference to the merits of the bill the practice of promising support in advance and usually before hearing both sides of the issues involved is a practice to be strongly condemned. A legislator is charged with a public trust very similar to the trust of a judicial officer. A judge who would announce his decision before hearing the testimony, all the testimony, would be severely criticized. Why should not a legislator be under equal obligation to wait until the issues are completely made before placing himself in a position from which he cannot consistently recede? Even having made such a promise, is he under greater obligation to keep it than to keep his prior and more sacred promise to the people that he will administer the functions of his office honestly and faithfully.

A striking example of the different attitudes of anticipated and actual responsibility was given by Mr. Ramsay MacDonald in a recent statement to the British House of Commons in comparing pre-election pledges with actual legislative duties. Mr. MacDonald said:

> "In regard to our pledges and their fulfillment, why should I not confess we were a little innocent in this matter? Things which seemed very simple to carry out when we were without experience became very complicated and difficult when we became members of a Cabinet responsible for them."

This frank admission, though interesting, may not be directly applicable to the practice of making promises of legislative action but until all of the facts are pre-

sented and ample time for careful consideration of the issues involved, it does seem that a legislator should not promise his official support for any measure.

TRANSPORTATION ALLOWED RESPITE

CONGRESS adjourned without amending the transportation act. The provisions of the act relating to labor relations and freight rates, although bitterly assailed, will stand until Congress convenes next December. The shipping public did not want the act tampered with until it had been given a fair trial. Those who wanted to amend or repeal important provisions alleged that the public was being influenced by insidious railroad propaganda and therefore should be ignored. Nevertheless, the public may feel gratified that the outcome of the transportation battle in Congress was in accordance with its wishes.

Perhaps constructive legislation pertaining to railroads can be formulated during the next session of Congress, since the elections will be over and legislative measures can be considered from the standpoint of principle instead of from the standpoint of political expediency. In any event, the railroads will have a further breathing spell. Railroad managements will have a further opportunity to demonstrate to the country that they can secure the maximum of efficiency without governmental interference. This they are already demonstrating.

The question of freight rate levels in the several classification territories and on different classes and commodities is still to be solved. This question can not be solved by Congress. It must be given most careful consideration. Its attempted solution should come only after a thorough and scientific investigation of the rate structure. The Interstate Commerce Commission should be directed to make such an investigation and should be given the machinery with which to undertake the task. When this is done, there is reason to hope that a proper relationship between the rates on basic raw materials and manufactured products, between long-haul and short-haul traffic, and between carload and trainload traffic and less-than-carload shipments, can be established without impairing the carriers' return on their investment, or their service.

One of the first measures on the calendar of the Senate to be considered at the session beginning December is the Smith-Hoch bill which provides for a general rate investigation such as is here outlined. This bill has been approved in conference and only awaits final action by the Senate. Of interest in this connection is the following paragraph quoted from the Republican platform: "We believe that the American people demand, and we favor, a careful and scientific readjustment of railroad-rate schedules with a view to the encouragement of agriculture and basic industries, without impairment of the railroad service."

ROCK DUSTING

THE eagerness with which coal mining companies are embracing the rock dusting theory for the prevention of minor accidents assures its early adoption as a means of saving the lives of hundreds of miners through the prevention of coal dust explosions. At the Cincinnati meeting of the American Mining Congress one entire session was devoted to the discussion of this important subject. The papers there presented appear in full in this issue of the MINING CONGRESS JOURNAL and it is to be hoped that the Cincinnati meeting and the presentation of the discussion through the pages of the technical press will awaken the industry to the necessity of full investigation of rock dusting and its adoption at every property where dust explosions are even a remote possibility.

A WORD IN JUSTICE

THE Sixty-eighth Congress will have its traducers. Some of them will be numbered among its own members. In truth, if one views its conduct only from the point of view of what is good government for a large nation, little can be said for much of the legislation which was enacted. It fell far short of wisdom in that it oppressed the people and invaded their liberties without adding anything to the powers which the government actually needs to perpetuate itself. Much of its conduct was, therefore, purely destructive. It destroyed the peace and the liberty of the people and broke down the friendly relations between a people and their government without doing the least good. Such things are inexcusable when viewed through the spectacles of a statesman.

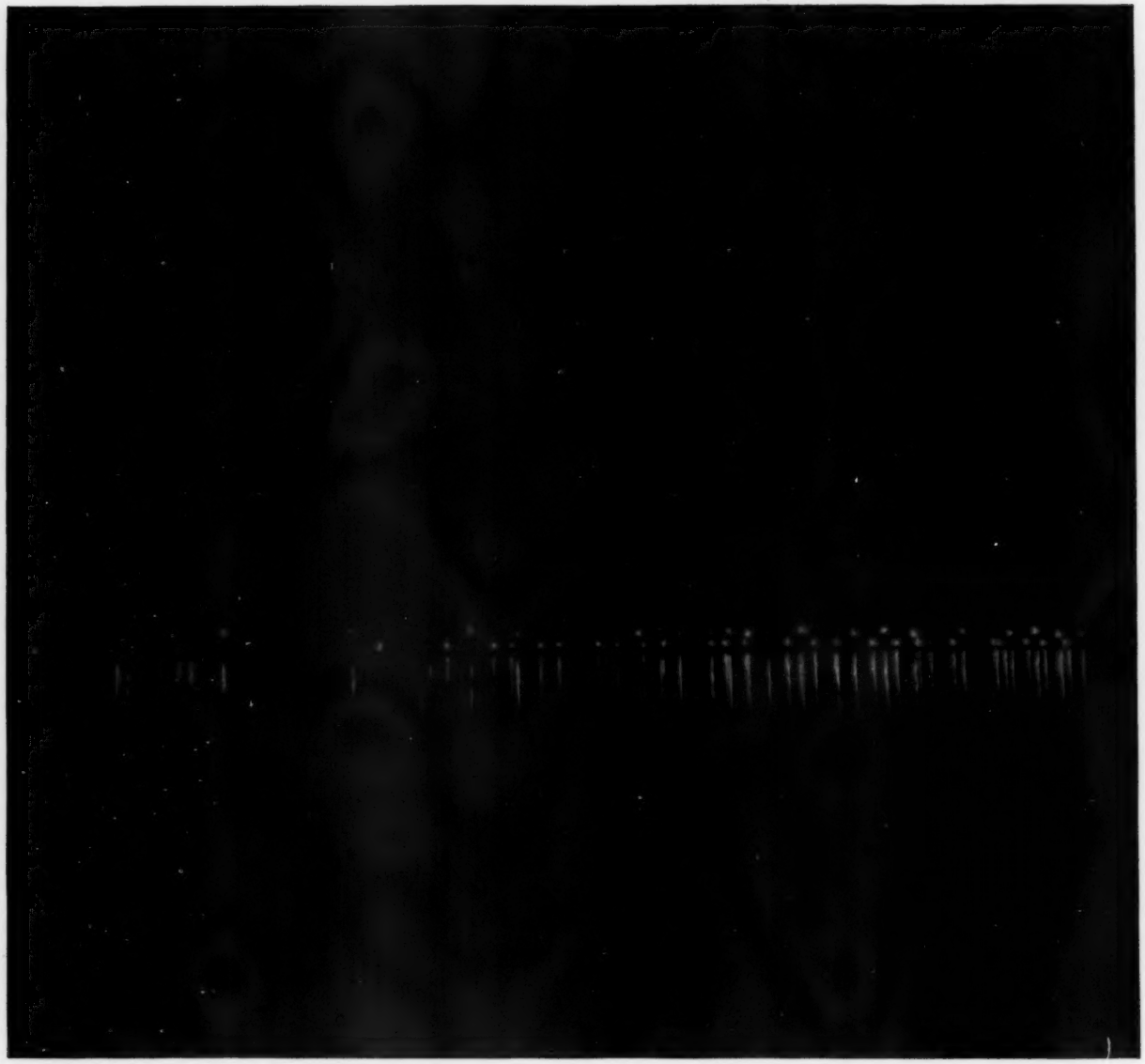
Even so, there is something to be said for the Congress. This is a republic. That term implies representative government. (It is not, incidentally, a democracy which implies direct action by the people.) The representatives are supposed to do what the people want done. The people never say what they want done. No member of Congress can possibly circulate among all of his people and cross-examine everyone. He must guess. He must come as near to striking the average of public opinion as he can. In doing so he can only surmise their views after studying the kind of publications they pay for.

The daily press always prints much about the doings of the radicals. The popular magazines make heroes of the radicals and devils of the conservatives. And, the people buy millions and hundreds of millions of copies of these periodicals. The average member of Congress can only believe that the people must want this sort of thing or they would not pay for it. They apply the most severe of all tests—the commercial test. They say that the people want what they pay for.

The members of Congress get another reaction, also. It is a curious one, to be sure, but still it is a reaction. That is, if the Congress does not grind out a long list of bills every week and pass volumes of legislation every month, the press of the country howls and cartoons that nothing is being done; the Congress is loafing on the job, et cetera. From that sort of thing, the members of Congress get the impression that the people want volume and not quality of legislation. They try to give the country what it wants.

In the end, the Congress, having enacted voluminous legislation, finds itself condemned by the same press for having burdened the people with so much that is new and experimental in legislation. And the weary member of Congress wonders what, after all, the dear people do want.

The point of all this is that the people got, from the Sixty-eighth Congress, about the kind of government they have been planning to get. They have been planning in that direction for a generation. What they have wanted and subscribed to is finally here and is a reality. Now the people say that they do not want it so. They are going to throw out the old gang and put in a new one. With all proper deference to the "voice of God," the people have been a little slow in the matter of clarifying—for the edification of Congress—their own thoughts on this important question.



"Long" Bridge Across the Potomac at Washington

"All quiet along the Potomac tonight,
No sound save the rush of the river."

SECURITY HOLDERS AND THE REVENUE ACT OF 1924

Administrative Provisions Of New Tax Law More Important Than New Tax Rates—Corporate Distributions Affected—Makeshift Measure Sure To Be Revised

By McK. W. Kriegh

THE Revenue Act of 1924 is now on the federal statute books. Taxpayers, whether incorporated or unincorporated, should make a most careful study of its administrative sections which involve many changes in the phraseology of the 1921 revenue law and many new provisions that were not embodied in any prior revenue act.

The rate of tax on corporation income is not changed. The capital stock tax provisions are substantially the same as in the 1921 law. The normal and surtax rates on individual income are lower. The estate tax rates are materially increased. A gift tax, payable by the donor, is imposed upon the transfer of property by gift, whether the gift is made directly or indirectly, and the rates of tax on taxable gifts are the same as the federal estate tax rates. Stamp, excise, admissions, business and other special taxes are practically the same as were provided for in the 1921 law.

Rates of Minor Importance

From the standpoint of effect upon business, the rates of tax provided for in the 1924 act are of minor importance as compared with the revised, rewritten and new administrative provisions, many of which are of such far-reaching importance as to require minute study and analysis. Such analysis should be made in connection with each transaction affecting the taxpayer's status, property or income.

The administrative provisions that are of most vital importance to taxpayers engaged in business, and also to those who are holders of securities, are embodied in sections 201, 202, 203 and 204. Section 201 relates to distributions by corporations; section 202 to determination of gain or loss from the sale or other disposition of property; section 203 to recognition of gain or loss from sales and exchanges, and section 204 to the basis for determining gain or loss, depletion and depreciation.

Corporate Distributions

Section 201 governs the question of taxability of corporate distributions. There are five general classes of distributions: (1) those out of earnings or profits accumulated since February 28, 1913, termed "dividends"; (2) those out of earnings or profits accumulated, or increase in value of property accrued, before March 1, 1913; (3) those in partial or complete liquidation of a corporation; (4) those out of depletion and depreciation reserves, and (5) those made by corporations, which were classed as personal service corporations under the 1918 and 1921 laws, subject to conditions specified.

Section 201 (b) of the 1924 Act contains the presumption that every distribution is out of earnings and profits, whether accumulated prior or subsequent to March 1, 1913. The 1921 law provides that any distribution by a corporation should be deemed to be made out of earnings and profits to the extent of the earnings and profits accumulated after February 28, 1913. It is provided in section 201(b) of the 1924 Act that distributions out of earnings and profits accumulated prior to March 1, 1913, shall be applied against the basis of the stock for the purpose of determining both gain and loss from its subsequent sale. The same provision applies to distribution out of depletion and depreciation reserves.

Liquidating dividends are treated in section 201(c) as a sale of the stock, so that any gain is treated in the same manner as a capital gain from the sale of property. It is expressly provided that in the case of amounts distributed in partial liquidation, the part of such distribution which is properly chargeable to capital account shall not be considered a distribution of earnings or profits within the meaning of subdivision (b) for the purpose of determining the taxability of subsequent distributions.

Depletion Distributions

The 1918 and 1921 Revenue Acts recognized three bases for depletion: (1) cost of the property; (2) market value on March 1, 1913, and (3) discovery value after March 1, 1913. Amounts distributed out of depletion and depreciation reserves based upon cost or March 1, 1913, value have been treated by the revenue department as a return of capital and taxable only if and to the extent that they exceed the basis of the stock; but distributions from depletion reserves based upon discovery value have been treated as ordinary dividends subject to high surtax rates.

The general tax committee of the American Mining Congress has continuously sought to have established the rule that all distributions from depletion reserves are capital distributions of the same kind as the receipts on a sale of stock, whether these distributions were out of a reserve based on cost, March 1, 1913, value, or discovery value. It was contended that Congress contemplated no distinction between these three bases.

The revenue department, however, refused to recognize discovery value as a capital reserve or discovery depletion distributions as distributions of capital. Congress, therefore, provided in the 1924 act that the provisions of section 201, subdivision (d), relating to distributions from depletion and depreciation reserves based on cost or March 1, 1913, value, should also apply to distributions from depletion reserves based on discovery value of mines. This removes a manifest discrimination that has been practiced by the Treasury Department against stockholders of mining corporations that have been allowed discovery value. For individual owners depletion on all bases are non-taxable alike to the producer or discoverer before or after March 1, 1913. The principle has been recognized that the ore reserves are the owner's capital. Yet corporate stockholders who are the ultimate beneficiaries have been compelled to pay taxes on distributions from discovered capital reserves on the same basis as ordinary dividends. Congress did not intend that this should be required and amended the law in order to remove the discrimination.

The Depletion Base

Subdivision (b) of Section 204 provides that the basis for determining the gain or loss from the sale or other disposition of the property acquired before March 1, 1913, shall be the cost of the property or its fair market value as of March 1, 1913, whichever is greater. This change operates in favor of the taxpayer. This provision also applies in the determination of depletion and depreciation. Under prior laws the basis for the determination of gain or loss, depletion and depreciation in the case of property acquired before March 1, 1913, was the fair market value on March 1, 1913. Even though it could be shown that the original cost was greater than the March 1, 1913, value, the taxpayer was allowed only the March 1, 1913, value as his basis. Subdivision (b) also embodies another new provision which provides that in determining the fair market value of stock in a corporation as of March 1, 1913, due regard shall be given to the fair market value of the assets of the corporation as of that date. This provision was inserted to compel the Treasury Department to give proper consideration to the value of corporate assets in valuing the stock of close cor-

porations as of March 1, 1913, and to prevent the use of forced or isolated sales of comparatively small blocks of the stock as a measure of valuation.

Limitation on Discovery

The 1924 act in subdivision (c) of Section 204 limits the depletion allowance based on discovery to 50 percent of the operating profit from the property upon which the discovery has been made. The 1921 act limits the discovery depletion to 100 percent of the operating profit from the property upon which the discovery was made. The change effected by the new law will not reduce the allowance of mining companies based on discovery since few, if any, mining companies, even in the case of short-life mines, have received depletion allowances approaching anywhere near 50 percent of their operating profit from the property on which the discovery was made.

During the hearings before the Senate committee investigating the Bureau of Internal Revenue, of which Senator Couzens, Michigan, was chairman, there was some criticism of the manner in which the discovery clause had been administered by the Department, but it was not shown that the mines had received any particular benefit from the discovery clause on account of the strict interpretation of the clause by the Department as applied to mines. The Senate passed an amendment providing that "discovery shall include minerals discovered or proven in existing mines or mining tracts by the taxpayer after February 28, 1913, not included in any prior valuation." This amendment was defeated in the conference committee. Of course, the department has ample authority to properly deal with this question by regulation, which, no doubt, it will exercise in due time. When the original clause was enacted into the 1918 law, Congress unquestionably understood and intended that the provision would apply not only to discoveries of new mines but to discoveries of new mineral deposits and new mineral reserves in existing mines, where such deposits or reserves were not known to exist until disclosed by exploration and development work, and therefore could not be considered in connection with a prior valuation.

Reorganizations

Section 204 (a) embodies provisions that are retrospective in their application to mining companies that have been reorganized since December 31, 1917. Paragraph 7 of subdivision (a) provides that where, in connection with a reorganization, assets are transferred from one corporation to another, the assets so transferred shall retain the same basis in the hands of the new corporation as they had in the hands of the old corporation. This provision applies, however, to cases in which an interest or control in the assets so transferred of 80 percent or more remains in the same persons immediately after the transaction is consummated.

The American Mining Congress stood alone in opposing this provision before the Ways and Means Committee. But the committee thereupon fixed the dates from which the provision would be applicable at December 31, 1917, in paragraph 7 and December 31, 1920, in paragraph 8, subdivision (a), instead of February 28, 1913, which was the date proposed by the Treasury draft of the bill. This, of course, eliminated reorganizations that occurred between February 28, 1913, and December 31, 1917. Members of the House and Senate Committees did not give the question of retroactivity the consideration that it would have received if the many companies affected had filed protests.

Paragraphs 7 and 8 are retroactive in that stockholders who have purchased stock in a reorganized company on the basis of the fair market value of the assets as shown at the date of transfer will find their capital base arbitrarily reduced in all cases where the market value at the date of transfer was greater than the value for depletion and depreciation purposes in the hands of the predecessor company. In other words, if the asset value per share for depletion and depreciation purposes in the hands of the predecessor company was $10 and the asset value per share in the hands of the reorganized company was $100 based upon the fair market value at the date of transfer to the reorganized company in accordance with Treasury regulations, the stockholder who buys stock in the reorganized company, paying therefor a price of $100 per share, would be permitted to receive in tax-free distributions from the depletion and depreciation reserves of the corporation only $10 per share. Such stockholders would have to pay a tax on any amount in excess of $10 per share, even though they would still have $90 per share of capital to be returned. The injustice of this is so manifest that it is impossible to understand why Congress permitted this provision to be enacted into law. Security holders in companies that have been reorganized since December 31, 1917, should give careful study to the provisions of Section 204 as well as Sections 201, 202 and 203.

Board of Tax Appeals

The new law creates a board of tax appeals to be independent of the Treasury Department, to which taxpayers have the right of appeal before the assessment of any additional tax by the revenue department. Taxpayers will have the usual 30 days in which to protest the action of the income tax unit and have a hearing before that unit on questions in dispute, and 60 days after final action by the unit in which to appeal to the board. The rules and regulations governing procedure in appeal cases are being worked out. The members of the board will be appointed in the near future. Although members of the board are to be appointed by the President, and are to act independent of the Treasury Department, the President has requested the Secretary of the Treasury to recommend candidates for appointment. It, therefore, appears that notwithstanding the intention of Congress that the members of this board shall be entirely independent of Treasury influence, the Secretary of the Treasury will have a voice in their appointment and presumably any candidate disapproved by him will not be successful.

Further Revenue Revision

Statements made by the President in connection with his approval of the new law, and by leaders in Congress, indicate that revenue revision will be taken up again at the next session of the Sixty-eighth Congress. In any event, revision of the tax law will be a major issue in the Sixty-ninth Congress when it meets in 1925. In the meantime, the good and bad points of the 1924 act will have become known to the taxpayers and an intelligent effort may be made to simplify and clarify the law as well as repeal the provisions which work unjustly in their application, such as the retroactive provisions of paragraphs 7 and 8 of subdivision (a), Section 204. Taxpayers will do well to familiarize themselves with every provision of the 1924 act so that their wishes may be made known to Congress when it undertakes to enact another new law.

VANADIUM DEPOSITS

Vanadium minerals have been found in San Antonio, Pachuca, in Mina District, south of Huetamo, Michoacan, in the State of Guerrero, and principally at Placer de Guadalupe, Chihuahua, where ores of great radio activity, and pitchblend, have been found, says "Greater Mexico."

The Placer de Guadalupe is 75 miles northeast of Chihuahua City. Water from this mine is radio active, and some Carnotites containing about 6 percent of uranium have been deposited on the surface. The pitchblend of that belt contains 80 percent of uranium. The radio activity of the ores is as high as 0.04348 electrical units. Strips of cloth saturated with the concentrates make strong and clear photographic impression on sensitive plates in less than 72 hours.

ACTUAL EXPERIENCES WITH AND TRIED METHODS OF APPLYING ROCK DUST

Two General Methods, Zoning And Coating, Used — Six Advantages Of Zoning System Outlined—Success Of Coating System For Passageways Now Established—Ideal Protection From Combination Two Systems With Zoning Used As An Assistant To Coating—Actual Experience With Rock Dust Given

By J. E. Jones*
Safety Engineer, Old Ben Coal Corp.

GENTLEMEN:

It is a great honor to me to be the representative of the Old Ben Coal Corporation and its president, Mr. D. W. Buchanan, at this Mining Congress on this subject of safety. I represent a corporation and a man who consider safety equally as fundamental and important as production.

Our application of dust covers a period of nearly seven years. At the beginning of that time we adopted the policy of rock-dusting as outlined by the Bureau of Mines, making the necessary changes to suit our working conditions.

There are two general methods of rock-dusting, one may be called the zoning method and the other the coating method. The theory of the first is to have rock dust in abundance at regular intervals throughout the mine, the dust so installed that it can be easily thrown into suspension in the event of an explosion, thus stopping the explosion flame at the first rock-dust zone the explosion comes in contact with. The theory of the second is to have the ash content of all the mine dust greater than will permit its ignition, thus making one rock-dust zone of the entire mine. Each system has its strong and its weak points, but, fortunately, the weak points of the one are the strong points of the other, so that a combination of the two systems gives an ideal rock-dusting condition.

The Zoning System

This is the system that the Old Ben Coal Corporation adopted, primarily, largely because of the excellent opportunity the panel system of mining offered for zoning into panel units.

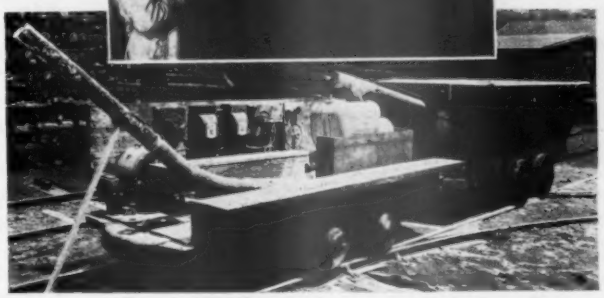
Briefly, the panel system used is that main entries are driven in two opposite directions from the shaft bottom. At intervals of 1,500 feet, cross-entries are driven in opposite directions at right angles to the main entries. At intervals of 500 feet, panel entries are driven in opposite directions at right angles to the cross-entries. Each panel has a maximum number of thirty-four men, including company men.

*Address made before the American Mining Congress at Cincinnati, Ohio, on May 16, 1924.

In the early part of our rock-dusting experience a shale-dust zone was installed at each intersection of entries. Later intermediate zones were installed in some of the mines midway between the regular zones. The distance between panels being 500 feet results in the regular zones being that distance between centers. Each zone extends 100 feet in each of the four directions, leaving a distance of 300 feet between the larger zones. The intermediate zones, where installed, cut this distance in two, making a distance of 150 feet between zones.

Each zone consists of an Old Ben concentrated barrier installed over the haulage road out by each panel, the roof and ribs of the haulage road coated with rock dust for 100 feet in all four directions and dust troughs installed for 100 feet in all four directions in the aircourses, the aircourses having no track. Troughs and piles of rock dust on platforms are also installed wherever space permits at the side of the track in each zone territory.

The concentrated barrier is an overhead barrier with a capacity of 1½ to 3 tons of rock dust and so constructed that should it be tripped accidentally or mischieviously there is no danger of injury to a person who might be directly under it or approaching it on a fast moving train of locomotive and cars. The troughs are balanced in shallow notches so that they are easily overturned with a slight force. Each trough holds approximately 60 pounds of the rock dust.



U. S. Bureau of Mines Photo

Blower Rock-Dusting Machine, Inland Collieries Co., Indianola, Pa. (Above) Rock Dusting in the Bureau of Mines Experimental Mine at Bruceton, Pa.

The advantages of the zoning system are:

(1) Rock-dust installations located at intersections of territories that will remain in working condition for an indefinite length of time.

(2) Entrances to old workings which are inaccessible and which generally contain a greater gas hazard than elsewhere can be efficiently protected.

(3) An abundance of rock dust installed at regular intervals through which it would be difficult to force an explosion flame even though a sufficiently high gas content existed to propagate an explosion with the assistance of mine dust having a high ash percentage.

(4) An abundance of rock dust in aircourses or other trackless passages.

(5) The amount of rock dust is such that when affected by moisture this results only in the forming of a thin crust over the mass of dust.

(6) Available rock dust for use in extinguishing mine fires.

The disadvantages to the zoning system are:

(1) The relative high cost of installation as compared to the coating system.

(2) Ignition of coal dust and propagation of explosions are not prevented in panels or between rock-dust zones.

(3) Not equally adaptable to all systems of mining.

The Coating System

To a limited extent this system was used by Old Ben at the beginning of its use of rock dust. This coating was applied on the haulage entries in the rock-dust zone districts in an effort to install as efficient a supply of the dust here as in the aircourses. Such installation was made by hand.

The development of a rock-

dusting machine was retarded by the many reports of the difficulty of applying the rock dust to a surface mechanically. Three methods have been tried—a hand-power machine, compressed air with aspirator, and electric-driven high-speed fans. This last method has proved successful. The machine now in use is of such a capacity that 2,000 to 3,000 lineal feet of haulage entry is dusted per hour by two men making a distribution of 2 pounds of rock dust per lineal foot. The fan is driven by a dust-proof motor, the dust is automatically fed into the discharge line and is directed onto one side of the entry, requiring two trips of the machine to complete the dusting of one entry. To double the speed of dusting will but require a machine of double the capacity with a discharge pipe for each side of the entry.

The success of the coating system for passageways equipped with track is now established. This is because of its low relative cost and the high resultant ash content of the mine dust along the passageways where this method has been applied.

The combination of the strong air and dust blast performs other duties that are of importance:

(1) Coal dust in the path of the blast is immediately forced into suspension and thoroughly mixed with the rock dust.

(2) Coal dust is forced from the crevices and pores of the coal ribs and from the timbers and is replaced by the rock dust being forced under high pressure into the very small openings.

(3) High places which are usually timbered are always dust laden with the finest of coal dust. Such places are easily accessible with the strong air and dust blast used.

(4) It might also be mentioned that some value is placed upon the additional illumination given because of the white walls and roof.

The coating method of dust application will require more dependence upon the analysis of the mine dust than that required in the zoning method. We have taken samples of dust before and, after the coating application, obtaining in part the following results: The higher than normal ash content of the mine dust before coating is due to the settling of rock dust which had been carried by the ventilation current at the time the rock-dust zones were installed.

The tabulations below show that a finer mine dust results after the application of the rock dust than before it has been aplied. Sample No. 6 was taken four months after the coating was done and shows that a decrease takes place in the ash content. Our experience teaches that the first two applications should be less than three months apart and that three or four applications should be given during the first year at regular intervals. Probably two applications per year would be sufficient thereafter, one being in midsummer when the mine moisture would assist in making the rock dust stick to the roof, ribs and timbers.

The application of the rock dust into aircourses where track is not installed does not give the high degree of satisfaction as enjoyed with direct application to the ribs and roof. This is obvious inasmuch as the aircourse cannot be reached by the dust discharge from the rock-dusting machine except by tubing, and this only at intervals, depending upon the distance between crosscuts.

The length of aircourse efficiently dusted by this method depends almost wholly upon the velocity of the air current and the length of time the dust is blown into the aircourse. Results from experiments show that in a velocity of 680 feet of air per minute 61 percent of the dust blown into suspension is deposited on the floor and 17 percent is deposited on the roof and ribs in the first 100 feet from the machine.

Further results from blowing 4,000 pounds of dust for 50 minutes into an air current of 680 feet per minute traveling without loss or gain for 2,600 feet in an entry of 7 by 14 feet cross section for the entire distance are as follows: At 100 feet from source, 14 pounds of dust deposited per lineal foot of entry; at 600 feet from source, 9.3 ounces of dust deposited per lineal foot of entry; at 1,200 feet from source, 3.8 ounces of dust deposited per lineal foot of entry; at 2,600 feet from source, 1.7 ounces of dust deposited per lineal foot of entry. From 600 feet to 2,600 feet from the source, and apparently beyond the 2,600-foot station, the distribution of rock dust on the roof and ribs was equal per square foot to that on the floor.

It is apparent at long distances from the dust source that sufficient dust is in suspension to be of considerable value, but actual weights show that the quantity of deposited rock dust ceases to be of much value at a short distance from the machine.

Rock dust on the floor of an airway is of value, but not in proportion to an equal amount on the roof and ribs, for the following reasons:

(1) It covers and is mixed with a higher ash mine dust than that deposited on roof and ribs.

(2) When in contact with a fireclay floor it is apt to absorb moisture and would be difficult or perhaps impossible to be thrown into a cloud of dust in the event of an explosion.

(3) Rock dust deposited on the roof and ribs is better located to be forced into suspension.

(4) It is subjected to faster deterioration by being covered with roof falls than dust on the ribs.

To give an aircourse a rock-dust coating that will approach the efficiency of that given on the haulage ways requires application at frequent intervals into the aircourses. Such intervals should not be greater than three crosscut lengths where crosscuts are 60 feet apart. This necessitates small, well-fitting doors installed in every third stopping, such doors to be large enough for a man to pass through. Part of the equipment carried by the rock-dusting men with the machine is a board slightly larger than the doorway in the stopping near the bottom of which is a round hole of the same diameter as the canvas tubing. The tube is inserted through the hole and the board placed over the open doorway.

To eliminate guesswork, the dust is blown into the aircourse at each station for a timed period of 10 minutes. This gives a quantity of 800 pounds of dust per 200 lineal feet of aircourse with our present dusting machine, which is an average of 4 pounds per lineal foot of aircourse. After the first two or three applications given to the mine, the time of dusting at each station may be reduced to 5 minutes.

SAMPLES TAKEN PRIOR TO COATING APPLICATION

	Percent volatile matter	Percent fixed carbon	Percent ash	Percent moisture	Percent through 20 mesh	Percent through 48 mesh	Percent through 100 mesh	Percent through 200 mesh
No. 1	26.8	46.2	20.3	6.7	100	92.7	84.1	75.9
No. 2	28.2	48.9	15.9	7.0	100	90.8	77.4	56.1
No. 3	28.0	46.5	17.6	7.9	100	66.1	40.0	39.7
Average of 3 samples	27.7	47.2	17.9	7.2	100	83.2	67.2	57.2

SAMPLES TAKEN AFTER FIRST COATING APPLICATION

	Percent volatile matter	Percent fixed carbon	Percent ash	Percent moisture	Percent through 20 mesh	Percent through 48 mesh	Percent through 100 mesh	Percent through 200 mesh
No. 4	13.1	12.6	69.4	4.9	100	97.2	93.8	88.3
No. 5	14.6	17.5	59.4	8.5	100	94.1	92.6	88.1
No. 6	16.4	34.3	43.5	5.8	100	93.8	86.1	75.1
Average of 3 samples	14.7	21.5	57.4	6.4	100	95.0	90.8	83.8

SAMPLE OF OLD BEN SHALE DUST

Percent volatile matter	Percent fixed carbon	Percent ash	Percent moisture	Percent through 20 mesh	Percent through 48 mesh	Percent through 100 mesh	Percent through 200 mesh
5.9	0.6	90.7	2.8	98.5	98.1	97.3	88.4

The advantages of the coating system are:

(1) High efficiency of dust application, especially on haulageways.

(2) The relative low cost as compared with the zoning system.

(3) The possible protection of the entire mine within reach of the haulage system by increasing the ash content of the mine dust above an explosion propagating condition.

(4) The removal of coal dust, especially that which has become deposited in high places on timber and lagging and which is extremely fine and low in ash and depositing in its stead the non-explosive mixture of rock dust and coal dust.

(5) Its efficiency is not affected by any system of mining that may be in use.

The disadvantages of the coating system are:

(1) The inability to dust abandoned workings.

(2) Coal dust in aircourses not thoroughly mixed with the rock dust and the possibility of coal dust on the roof and upper part of ribs in high places in aircourses not being coated with the rock dust.

(3) The protection given by a well-dusted entry with the coating system depreciates much faster than does a well-installed dust zone with the zoning system, due to passing of trips and spalling of roof and ribs displacing the rock dust, and continuous depositing of coal dust. The ash percentage in the coating system gradually decreases, thus requiring close supervision and frequent applications.

Neither of these two systems alone can be assured to give complete protection against local coal-dust explosions, but the greater territory protection and lower installation cost of the coating system places this system first, transferring the zoning system into second place. An ideal protection policy can be obtained by using the zoning system to assist the coating system by the installation of a permanent zone at the entrance to each main cross-entry section, at the entrance to each abandoned territory, and at 500-foot intervals on aircourses. Such installations would be low in cost, since troughs would be used exclusively in all these mentioned places except that a concentrated barrier would be installed at each main cross-entry entrance. In addition to giving the mine full protection against coal-dust explosion propagation, this method would also give available rock-dust supply at regular intervals for fire protection.

As previously suggested, the analyzing of mine dust in mines where the coating system of rock-dust application is adopted will be an important factor in the supervision of this work. Correct analyses largely depend upon correct sampling. The usual pan and brush method of collecting mine-dust samples is not satisfactory, because the most important dust is usually carried away by the ventilating current. We collect our dust samples by air suction, using for this purpose an ordinary vacuum cleaner as used in residences. The handle, wheels and dust bag are removed and small bags used to collect the samples. The motor, of course, must be suitable for the electric current used in the mine. In mines not electrically equipped a hand-operated suction device can be used. In such mines some other power must be used to operate the rock-dusting machine.

Actual Experiences with Rock Dust

Safety differs from other departments of industry in the knowledge of what degree of accomplishment has been or is being done. These other departments can in a relatively short time show, in dollars and cents or by some other measure, the amount of success or failure a device or method has proved to be. The story of safety progress largely depends upon statistics, and statistics depend upon such a multitude of things that the information desired is sometimes difficult to get. The counting and tabulation of an accident that has occurred is a simple matter. The counting and tabulation of an accident that has been prevented by a safety device or safety method is not so simple, for perhaps the accident would not have occurred anyway.

This is, in part, true in our experience with rock dust. Usually it is impossible to determine that an explosion would be a disastrous one were it not because of rock-dust installation. It is always possible, however, to ascertain whether or not the rock dust stopped the propagation of an explosion. Of this much we are certain, that we have never had an explosion flame pass through a rock-dust zone.

Since we began the installation of rock dust in the winter of 1917-1918 we have had nine explosions. For our present study these nine may be grouped as follows:

(1) Those in which the explosion flame did not reach the nearest rock-dust zone.

(2) Those which originated in a rock-dust zone.

(3) Those in which the explosion flame did reach a rock-dust zone but were not of sufficient violence that we can be certain that the explosion would have stopped had the dust zone not been there.

(4) Those in which the explosion flame did reach a rock-dust zone and were of such great violence and heat that there is no question but that a disaster would have been the result had it not been for the rock-dust installation.

In group 1 it is evident that the rock dust played no part in stopping the explosion. We have had two such explosions, and in both instances the rock dust at the nearest zone was thrown into suspension.

Four of our explosions can be classified under group 2. One of these was very violent, knocking down I-beams, blowing out concrete stoppings and charring the flame side of the collapsed concentrated barrier up to which point the flame had traveled. It is probable that this explosion would have been disastrous had it not been for the rock dust. The flame-affected territory was 100 feet in length. The other three were not extremely violent, but two of them were of intense heat.

We place one explosion in group 3. The evidence after the explosion did not indicate much flame or violence, although the men in the vicinity are emphatic in their statements that the flame filled the entry until it reached the rock-dust zone, where it was extinguished instantly. The origin of the explosion was less than 100 feet from the zone.

Under group 4 we classify two explosions. There is no question but that disasters would have been the result on both of these occasions were it not for the rock-dust zones. The violence continued for over 3,000 feet in each instance, but the flame was extinguished at the first rock-dust zone encountered.

This pioneer work of rock dusting done by the Old Ben Coal Corporation has been very high in cost, but such high cost is not necessary for any other company to duplicate, for we now consider that the experimental stage of rock dusting is practically finished and, until some other and better method of coal-dust explosion prevention is developed, rock dusting is established.

Application with the coating method assisted by the zoning method will result in the necessity of but one-fourth the number of troughs and one-tenth the number of concentrated barriers, but will require approximately the same amount of rock dust as used with the zoning system alone.

Little, if any, more cost will be necessary to efficiently protect a mine with rock dust with a well-established system perfected than is now the practice in many mines with the imperfect and unsatisfactory system of watering.

The greatest experience hazard we have in our coal field in Southern Illinois is that of explosions. It is with considerable feeling of gratification and satisfaction that we now have a dependable means of safeguarding life and property against this danger; simply requiring that sufficient rock dust be properly installed before the explosion occurs.

OCCURRENCE, CHARACTERISTICS AND BEHAVIOR OF COAL DUST*

More Attention Must Be Given To Curtailment Of Sources Of Ignition—Use Of Water Is Ineffective And Costly—Rock Dusting Advocated

By J. W. PAUL†

THE subject Coal Dust, as it appears in the title of this paper, will be treated with respect to the explosibility of dust in coal mines.

Among mining men there no longer should be any doubt or skepticism about coal dust being explosive when suspended in the air in the presence of an open flame or other igniting medium, such as an electric arc.

J. W. Paul

Dusts from different coals have different degrees of both ignition and explosibility. A dust that is most easily ignited does not necessarily produce the greatest violence or give the greater velocity of propagation.

The fineness of the dust and its percentage of volatile combustible gases are determining factors in the degree of ease with which the dust may be ignited, whereas its friability and purity may determine its ease of propagation. These features have been brought to attention in a study of exploded coal mines that produce coal of high and low volatile coal respectively, and the tests in the Bureau of Mines experimental mine have confirmed this observation.

In considering the occurrence of coal dust, and while it is not possible to prevent the making of dust, it is possible to control the quantity and to treat the dust in such manner as to minimize its influence as an explosive agent if not make it immune to explosibility.

Coal dust as an explosive agent embraces material that will pass through a 20-mesh sieve (having 20 openings per lineal inch, or 400 openings per square inch) and such material will contain much that will pass through finer screens and the finer the dust the more explosive it becomes. As an explosive agent coal dust is dangerous only when it is raised as a cloud in the air in the presence of some igniting medium.

The quantity of explosive coal dust present is generally expressed in pounds per foot of entry in a mine, but the more exact and scientific method is to state the quantity in ounces per cubic foot, since the degree of density of the dust in suspension is a measure of the explosive violence of the dust and air mixture. In tests conducted by the Bureau of Mines it has been found that 0.032 ounces of coal dust (Pittsburgh bed) is the least quantity per cubic foot of space which will propagate an explosion.

This quantity of dust, when it has settled on the roof, ribs and floor of a haulage road 5 feet high by 9 feet wide, gives a coating that is as thin as a sheet of writing paper and by a casual inspection would not be observed, and the practical man would probably pronounce the entry free from a dangerous quantity of dust. In most dry sections of a mine, a much greater quantity of dust is present, but there may be mixed with the coal dust some inert dust that comes from the roof, from the impurities of the coal bed, or from the floor, and these impurities make the coal dust less sensitive to ignition or explosibility. Therefore, to determine the danger from the degree of explosibility of the mixed dust, it becomes necessary to collect samples of the dust for chemical and physical analysis. However, in some mines having a solid roof, hard floor and few impurities in the coal bed, the dust may be reliably assumed to be principally from coal.

The characteristics of the dust in a mine depend upon a number of operations, factors and conditions. Coals vary in their chemical composition, with respect to content of moisture, volatile matter, fixed carbon and ash, and also in physical quality, with respect to degree of hardness, structure and friability, and all of these factors govern the character of the dust made from the coal. The friable or softer coals produce the most fine dust, the splints produce the least, and this is mostly coarse with little of the finer sizes, a fact that may account for the good record, so far as dust explosions are concerned, of mines producing splint coal.

Under certain laws (Stokes) of physics the finer a dust, the longer it will remain in suspension before it comes to rest and the finer a coal dust, the greater is its explosive influence, consequently, in mines the more dangerous dust settles on the roof timbers and on the ribs of the coal where it is most easily dislodged and put into suspension by a sudden blast of air. This fine dust is therefore always available to take part in a coal dust explosion that may originate in any part of the mine, although the floor of the mine may be damp or wet. The dust on the floor may be mixed with much coal coarser than 20-mesh but a sample may show that there is sufficient fine dust present to propagate an explosion—all that is needed to put this road dust in suspension is the mechanical action of a strong enough local explosion of gas or dust or a blown-out shot of black powder. A derailed trip of mine cars or a run-away trip has raised a dust cloud which has been ignited by open lights or electric arcs and produced an explosion which has extended through a large part of a mine and caused the loss of many lives.

Coal dust, lying quiescent, presents a potential explosion hazard, but when suspended in the air in a cloud of sufficient

(*Continued on page* 302)

U. S. Bureau of Mines Photo

Rock Dusting, Talk O' Th' Hill Collieries, Stoke-On-Trent, England

*Published by permission of the United States Bureau of Mines.
†Chief Coal Mining Engineer United States Bureau of Mines.

INVESTIGATIONS INTO ROCK DUSTING FOR COAL DUST EXPLOSION PREVENTION*

Introduction Of Rock Dusting In American Mines Presents New And Difficult Conditions—Manner In Which Bureau Of Mines Can Cooperate Outlined

By Geo. S. Rice
Chief Mining Engineer, United States Bureau of Mines

THE Bureau of Mines early began experimenting in the use of inert dust and the writer who was in charge of mine explosion investigations decided ten years ago, as the result of testing, that the use of inert dust in sufficient quantities was an efficient means of preventing coal dust explosions, but it was not until the recent run of mine explosion disasters began two or three years ago that the engineers of the Bureau of Mines as a body were fully convinced that watering as a preventive method was a failure. Meantime, in Great Britain and France they had passed through the same stages of uncertainty about the general practicability of rock dusting, and finally in 1920 the British mines department put into its regulations the requirement that "stone dusting," or as the Bureau of Mines had early termed it "rock dusting," must be used in all mines which were not naturally wet. Following this step, explosions occurred in some of the mines which had been considered sufficiently wet. Now the British mines department is considering measures in the requirement of stone dusting even in these naturally wet mines.

George S. Rice

On the other hand, 90 percent of the mines of Great Britain and in a majority of the mines of northern France where rock dusting has been used no explosions have occurred.

Although the writer and the bureau engineers have advocated the trial by mine operators of the rock dusting method for over ten years, only a few mines, notably the Old Ben Coal Corporation of Illinois, have tried rock dusting.

The recent visit of officials of the British mines department awakened great interest and has been influential in causing many operators, spurred by such great disasters as Castle Gate where watering was said to be thoroughly done, to look into the question. Now there are a number of mines in the Pittsburgh District, Indiana, Illinois, Utah and New Mexico that are inaugurating the use of rock dusting. Utah is the first state that has gone on record as favoring it through the adoption a few weeks ago of special orders effective June 1 requiring rock dusting in certain parts of the mines and with the expectation that this step will be made more inclusive as rock dusting methods develop which are suited to American mining conditions.

The Taffanel rock dust shelves were early tried out in the experimental mine and the author designed and tested closed rock dust barriers, their use was taken up by a few companies for the protection of panels as they could be used in conjunction with watering. It was never intended by the bureau, however, that these should be regarded as the principal means of explosion prevention, but only to be considered as a supplemental check in case of the inadequacy of the coal dust treatment in some panel or to prevent an explosion from passing from one mine to a connecting mine. But an explosion might develop in a panel which even if stopped at the mouth of the panel might kill many men in that panel and the after-gases drifting about the mine kill men outside the panel. To be used as the principal means would require that the barrier be close enough together so as to be practically continuous and that would be a most expensive method.

The conclusion therefore is that unless something unknown is developed which is better than rock dusting, there is no other means which is thoroughly effective. But the rock dusting must extend throughout the mine except at the immediate face and here any ignition which might occur from a blown-out shot or an ignition of gas would be localized at the face.

The introduction of rock dusting in American mines presents new, and it is acknowledged, difficult conditions, but it is believed that with the same amount of ingenuity and skill shown in the production of coal, that our mine operators and engineers will develop methods which will be not only effective in explosion prevention but also will be cheaper than watering of a truly effective character. The British and French use a great deal of hand labor in distributing rock dust. With the higher priced labor which we have in this country, we will have to employ mechanical devices. In this and in the following problems the Bureau of Mines can cooperate:

(1) Determining the character of coal dust of a mine. Dusts differ in their degree of explosibility. In general the higher the volatile combustible content, the more easily is the dust ignited. Conversely the less volatile combustible the less easily it might be ignited, although if it is ignitible in a dust cloud, the relative ease of starting an explosion of coal dust does not measure the violence of the explosion. That factor is probably more nearly measured by the thermal value of the coal. When the volatile matter is as low as it is in anthracite—that is, less than 6 percent, the dust is

U. S. Bureau of Mines Photo

Lighting Effect of Blowing White Dust, Talk O' Th' Hill Collieries, Stoke-On-Trent, England

*Address before American Mining Congress at Cincinnati, Ohio, May 16, 1924.

not of an explosive character so far as the bureau's tests have yet determined. In general the less the percentage of volatile combustible matter in the coal dust the less the amount of rock dust must be added to neutralize. This is strikingly shown by curves developed from the Bureau of Mines tests.

(2) Coal dust varies in its explosiveness according to its size. The finer the dust the more readily is the coal dust cloud ignited and the finest dust produces the most violent explosions. Some coals degrade into very fine sizes; others make rather coarse particles and there is then less danger and it requires less inert material to neutralize.

(3) Road dusts vary widely in their characteristics, not only in different mines but in different parts of a mine, according to the admixture of natural impurities from the roof, or from the floor, or from partings. The larger the percentage of natural inert material, the less rock dust will be required to make the road dust inert.

(4) The presence of a certain amount of methane or fire-damp in the mine increases the inflammability of the coal dust cloud in such gas mixture, and in gaseous mines this means that more rock dust must be added to offset the methane which may be present in the air, that is to say less than 5½ percent. Roughly speaking, for each percent of methane present, the percentage of rock dust in the mine dust must be increased 5 to 10 percent in the total mixture.

The Bureau of Mines has carried on for the past ten years studies of the explosion hazards in typical mines of typical districts. Those studies already made, as partly reported in Bulletin 167 are useful in considering the application of rock dusting, to other mines of the particular district, or which have similar kinds of coal dust production and other conditions, as found in one of the type mines reported in the bulletin. Another bulletin is now being prepared which will cover explosion hazard investigations since 1918.

It must be borne in mind that there are two types of tests that have been conducted at the experimental mine: those in connection with explosion hazard investigations and those in which the pure fine coal dust is employed, pulverized to the finest size (85 to 90 percent through 200-mesh sieve) and tested both mixed and unmixed with rock dust. Samples which have been gathered in those mines where the explosion hazard studies were made have shown that the coal dust in the road dust, including timber and rib dust, contained only a certain amount of the finest size, generally only 20 to 30 percent of it would pass through a 200-mesh sieve and very rarely as much as 40 percent. Accordingly less rock dust is needed to neutralize the ordinary mine coal dust than for coal dust all of which has been pulverized.

In Great Britain the regulations call for there being not less than 50 percent of incombustible material in the road dust of a mine. In order to be over this minimum it usually means that a road dust, after treatment, contains 60 to 70 percent of incombustible. This includes inherent ash and moisture of the coal plus external moisture and natural rock dust. Also, if determination is made by fire analysis when the rock dust or natural dust contains carbon dioxide, as where there is limestone present, that inert component is also included with the total non-combustible.*

These are very practical points inasmuch as it means that in a great many mines it does not require as much rock dust as might at first be thought necessary. The definition of "dust" either coal dust or rock dust adopted by the Bureau of Mines is that size of material the particles of which pass through a 20-mesh sieve. The British regulations consider 28-mesh or safety lamp gauze as a standard for dust. These regulations require that 50 percent of the rock dust employed shall pass through their 200-mesh sieve (equal to 250-mesh American standard) but make a further provision that larger size rock dust may be used, provided proportionately more is used and that at least 25 percent passes through 200-mesh. (American 250-mesh.) The bureau's tests support this view that coarser dusts may be used if used in requisite amounts, to give a sufficient amount of finest size.

Within the limitations imposed by the small number of field mining engineers of the bureau, the director of the bureau authorizes their cooperation with mine operators and the facilities of its testing laboratories and galleries for explosion hazard investigations of the type indicated.

There is one other important feature in which the bureau can cooperate: namely in determining the adequacy and harmlessness of the rock or inert dust which the operator may wish to use. It is well known from investigations carried on in hard ore mines that if siliceous dust is breathed it is injurious to the health. Exposure to breathing rock dust in rock dusted passageways in a coal mine does not present from its position the same degree of danger that occurs in drilling and shoveling in a quartz mine, yet it is thoroughly advisable not to employ sand or dust made from sandy shale or other material containing large amounts of free silica. In Great Britain the rock dust most largely used is pulverized from roof shale free from sandy material and it has not, after 10 or 15 years' use in some mines, been found detrimental to health. The suitability of a particular shale obviously free from sandy, flinty particles * cannot be determined by superficial examination.

For assurance on this point it requires microscopic examination and analysis of the rock dust proposed for use, and in certain cases of doubt tests on animals exposed to breathing it must be carried on. Such investigations the bureau is now making and will extend the service within the limitations of its facilities and personnel.

There are, however, certain materials which we are assured both by the British authorities and by our physicists in this country that are entirely safe to use and fortunately there are available sources in or near most coal fields, namely, dust made from pure limestone or from anhydrite or gypsum. There is, moreover, a very great indirect benefit in the use of dust, light in color. It brightens the walls of the passageways as if they were whitewashed and due to the color the presence of coal dust in dangerous proportions can be quickly discerned as men become experienced in the use of rock dusting.

Another great benefit of the rock dusting method is that the conditions in the passageways do not change in a few hours, as is the case in treatment by water, and therefore an examination and record can be made by the company inspectors and the state mine inspectors, which means something. This, supported by the gathering and analysis of samples, determines the adequacy of the treatment in the respective parts of the mine for a period of days or weeks or even months.

Although the Bureau of Mines has published numerous papers on rock dusting, there has recently been an insistent demand for rock dusting specifications by prospective users. The bureau has not yet officially determined standards suitable for American mining conditions, but with the authority of Director H. Foster Bain there has been prepared by J. W. Paul, Dr. R. R. Sayers, chief surgeon, and the writer some *tentative specifications* which have just been issued as a Report of Investigations.

The continued growth of The Dorr Company has required a further expansion of the executive department. Mr. J. V. N. Dorr, who has been president and general manager since the first organization of the company, has appointed Dr. R. B. Moore, at present head of the development department, as general manager, as of May 1.

---

*See Bureau of Mines Bulletin 225—Stone dusting or rock dusting to prevent coal dust explosions as practiced in Great Britain and France.

*Dr. J. S. Haldam, the eminent British psysiologist, has a rough and ready method of preliminary examination—take some course particles of the material to be tested, in the mouth and slowly chew it, if there are no gritty particles the indications are favorable.

ROCK DUSTING OF COAL MINES: EFFICACY, METHODS AND COSTS

Adoption Of Rock Dusting Creates Sense Of Security—Four American Companies Using Method—Cost Should Be Less Than One Cent Per Ton—Important Items For Consideration Explained

By JOHN T. RYAN*

INVESTIGATORS in the United States and in Europe concluded sixteen years ago that if enough incombustible dust were mixed with coal dust a nonflammable mixture would result. The practice of rock - dusting was initiated by a number of coal mine operators in both Great Britain and France from time to time since 1910, and in 1920 government regulations in Great Britain made rock-dusting compulsory in coal mines which were dry and dangerous. Mines of this class represent at least 85 percent of the mines in Great Britain. As a result of elaborate tests carried on in its experimental mine at Bruceton, Pa., the Bureau of Mines recommended rock-dusting as a means of preventing and limiting mine explosions at least ten years ago. However, only a few operators have adopted it in America—one in Colorado, one in Southern Illinois, one in New Mexico, one in Wyoming, and one in Pennsylvania, and in the order given. In each case there is a sense of great security not only on the part of the operator but the miner as well.

John T. Ryan

But rock-dusting in this country has taken on great impetus during the last two months. Recent federal regulations make rock-dusting compulsory in mines working government leases in Utah, beginning July 1, 1924. Legislative action favorable to rock-dusting is to be expected in Utah at an early date, also in other states. It is also to be expected that rock-dusting will soon be written into the inspection and rating schedules of our compensation insurance companies.

Mine operators are compelled to study the rock-dusting problem from an economic viewpoint. The scientific facts so ably presented by the Bureau of Mines must be commercialized and placed on an economic basis. Rock-dusting as practiced in Europe cannot be adopted in this country, because our mining and labor conditions are vastly different. It is claimed in Great Britain that rock-dusting costs about 0.1 cent per ton of coal mined. Costs in America on a twenty-year basis should be less than 1 cent per ton. Mining costs are relatively high now, and any increase whatever must be justifiable. It is believed that rock-dusting can eliminate from the miner's life 85 to 90 percent of the dangers of a mine explosion. Furthermore, if the coal-producing states should make rock-dusting compulsory, it will mean an equal burden, and the cost must be added to the price of coal.

One operator in the Pittsburgh district was given a cost of $3 per ton for limestone dust in carload lots, f. o. b. factory, by a reliable commercial pulverizing company. To this would have to be added about $1.70 for transportation and handling. If suitable material is available at the mines, crushing and pulverizing at the mine should be done for about $1 per ton.

In this connection the Carnegie Institute of Technology, in cooperation with the Bureau of Mines and an advisory board of mine operators and engineers in Western Pennsylvania, are considering fellowship research work relative to rock-dusting during the college year 1924-25. Data will be secured on costs, equipment, and methods of treatment, and in particular it is planned to rock-dust a 600,000-ton mine in the most up-to-date manner and keep accurate and detailed costs. These agencies have found means to carry on this work, and the results of this study will give mine operators valuable cost data which will enable them to estimate closely their rock-dusting costs.

Some mining men argue that it would be relatively easy to rock-dust a new mine, but it would be a big undertaking to treat an old one. In a sense this is true, but any mine, large or small, can be readily dusted if proper spirit is manifested and if the work is well organized. It can be done on the night shift or on idle days.

An operator planning to rock-dust a mine must keep the following points in mind:

1. The relative flammability of the coal should be determined. The Bureau of Mines is always glad to cooperate in this matter and is in a position to render this service.

2. Raw material suitable for rock-dusting should contain little or no free silica or moisture and be low in combustible matter. Pure limestone is an admirable material and shale is a very good material, and usually one of the shale formations associated with the coal measures is suitable, and it is much more economical to have the source of supply at the mine.

3. A plant to pulverize the dust to the proper fineness should consist of a simple preliminary grinder to grind the material to ¾ inch; then this ground rock should be taken to a pulverizer which will grind the material so that it will all pass through a 50 mesh, and at least 70 percent should pass through a 200 mesh. This equipment should preferably be installed at the mine, or underground if possible, and an equipment having 1,000 pounds per hour is ample.

4. The next essential equipment is a distributor to properly spread the dust underground. This equipment should be so designed that you could first air-blast the coal dust from the rib, roof, etc., and then dust the same face with the shale dust. It should have a capacity of 1 pound per second at a speed of not less than 1 mile per hour. It should be able, also, to deliver dust to the back of trackless entries at desirable points, the ventilating current depended upon as the distributor.

5. Rock-dusting should be done first on all haulageways up to and including room-necks and up to and including the face of all development work.

6. A simple sampling kit should be installed. The purpose of this is to take samples and analyze them for determining the amount of incombustible material. This should be so simple that the average man about the mine could operate it and run a test in a few minutes. Such a kit, developed by the Bureau of Mines, is now ready to be marketed by the Mine Safety Appliances Company.

7. Samples should be taken twice a month at predetermined points, except in heavy haulage entries where once a week may be required—never less than once a month. Experience will quickly show where and how often samples should be taken.

8. All entries should be cleaned up thoroughly and frequently as necessary and should be (*Continued on page* 302)

*Mine Safety Appliances Co.

ROCK DUST VERSUS WATER AS A PREVENTIVE MEASURE FOR MINE EXPLOSIONS

Humidifying Mine Air Not New Theory—Used For Fifteen Years In West Virginia Field—Is Costly And Unreliable—Rock Dusting Vastly Cheaper And Is Reliable

By EDWARD STEIDLE*

MINE explosions impress the mind with a sense of great disaster because they usually take a high toll of life and frequently do immense damage to property. With a view to eliminating them from the miner's life, the characteristics of gas and coal-dust explosions have been studied diligently by the Bureau of Mines since 1908.

Edward Steidle

Gas explosions are relatively easy to study and define. Upper and lower limits of explosibility of gas and air mixtures have been accurately determined, and the degree of violence can be anticipated. On the other hand, coal-dust explosions are difficult to study inasmuch as numerous factors influence the ignition of a mixture of coal dust and air and the propagation of flame in such a mixture. Investigators are still in doubt regarding many factors excepting the basic phenomena of an explosion. In general, the laws governing the propagation of flame in mixtures of explosive gas can be applied to explosive mixtures of coal dust and air. The uncertain factors are the effect of the degree of fineness of the dust, its chemical composition and physical character, and the effect of the size and conditions of the passageways along which the explosion travels.

The surest way to prevent a mine explosion is to exclude, as far as practicable, all means of ignition, or to control the use of mining appliances so as to render them free from danger. Lights cannot be excluded, but they can be rendered safe. The same is true of explosives and electrical apparatus which are required in the economic mining of coal.

Unfortunately, all of the potential means of ignition of a mine explosion cannot be entirely eliminated, therefore secondary preventive measures must be adopted—that is, the gas and coal dust must be made as difficult to ignite as possible. The low explosive limit of a mixture of gas and air is 5.5 percent, so by properly ventilating a mine the formation of an explosive mixture of gas and air can be prevented. This means is impossible in the case of coal dust, and, besides, coal dust is only dangerous when it is raised as a cloud by a gas explosion, "windy shot," wrecked trip, roof fall, etc. It is known that 0.03 ounce of pulverized dust suspended in 1 cubic foot of air is about the low explosive limit of a mixture of coal dust and air.

One way of rendering coal dust harmless is to treat it so that it cannot be thrown into suspension, for example, by watering. This is the method most commonly used and to a limited extent successfully. But it is deceptive and usually gives a false sense of security. It is well known that it is difficult to wet coal dust, and this may be demonstrated by trying to stir several handfuls of dry coal dust in a pail of water. Unless coal dust has been thoroughly wetted, enough dry dust may remain along the passageways to propagate an explosion when raised as a cloud. In fact, thick layers of dry coal dust are often observed floating on the surface of pools of water in old or undisturbed workings.

Eastern bituminous coal dust usually contains from 1 to 2 percent of moisture unless artificially dried. Some western coal dust contains as much as 10 percent of moisture. This inherent moisture does not aid materially in preventing an explosion, because, from all physical appearances, it is dry. It is very difficult to wet the surface of coal dust even by applying water direct. After the surface has been dampened, it is relatively easy to increase the moisture, and when the coal dust contains 30 percent, it is not expected to be inflammable, principally because it cannot be blown into suspension. No watering system is satisfactory unless it washes down constantly and thoroughly all the surfaces of the passageway and working faces being treated, and thus makes accumulations of fine dry dust impossible. The wet dust may be loaded out as it collects. Omission of watering for a single day may lead to a disastrous explosion. It may be added that in many mines thorough wetting of the dust aids air-slacking and causes falls of roof. The cost of efficient watering is prohibitive, and in some mines a sufficient supply of water is not available.

During the past year there has been much of discussion regarding methods of humidifying mine air as a means of making coal dust nonflammable. It is even proposed to heat the intake air to the normal mine temperature during the winter months. These methods are not new, as several mines in West Virginia were treated in this manner fifteen years ago. One wonders also why these methods have received so much attention lately when it has been so clearly demonstrated that air with a relative humidity of 100 percent passing through a dry mine does not wet pure dust nor is there sufficient water present by weight to extinguish a flame. The idea of heating intake air at zero temperature to normal mine temperature is obviously impracticable. The only real value of heated, humidified air is in preventing a naturally wet mine from being dried out during the winter months. Coal dust will absorb additional moisture when swept by supersaturated air, but this means a dense fog and consequently an impossible working condition.

Another and vastly more reliable and cheaper method of treating coal dust is to render it difficult to ignite by mixing with it a suitable inert dust such as shale or limestone ground fine. The density of limestone is somewhat greater than that of shale, but not different enough to be of importance in making an extinguishing dust cloud. The specific heat of rock dust is not as great as that of water, but the amount of water by weight in a cubic foot of air is measured in grains while rock dust when in a cloud is measured in ounces. When not less than a 50-50 mixture of rock dust and coal dust is thrown into suspension, the rock dust, together with the coal dust, absorbs heat and lowers the temperature of the flame of propagation below the ignition temperature of the coal dust. Also, the particles of rock dust get between the particles of coal dust and have a curtain-like effect.

One of the most reasonable merits of rock-dusting is the fact that, once the dust is distributed properly throughout a mine, it remains there indefinitely and is always "on guard." Rock-dusting should not be required more often than every three or four months, depending upon conditions. We are told that any percentage of rock dust is advantageous, and that a 10 percent mixture will reduce the pressure and corresponding violence of a coal dust (*Continued on page* 302)

*Carnegie Institute of Technology.

ONE WAY OF REDUCING OPERATING COSTS

Mines Lose 50 Percent Power From Inadequate Feeder Systems—Speeds Of Locomotives, Both Storage Battery And Trolley, Compared—Proper Speed For Gathering And Haulage Locomotives Considered

By C. H. MATTHEWS *

AS long as civilized man inhabits the earth there will always be the eternal hope of accomplishing what science has shown to be impossible. The alchemist of old had faith in the elixir of life and the transformation of base metals to gold. The inventor dreams of perfecting a perpetual-motion machine that will drive the wheels of industry without the expenditure of energy. Every human being likes to think of life as a romance and by this eternal faith has progress been made in producing every want and desire of mankind.

Every coal operator is a firm believer in perpetual motion but, being a practical person dealing with realities, he has a far different belief in this subject than the dreamer who hopes to revolutionize the world of science.

Perpetual motion to a mine operator means the continuous movement of coal from the working face, up the shaft, through the tipple or breaker and into cars for shipment. He is interested in the cost of delivering each ton of coal to the railroads and the price he receives for this coal.

The cost of producing a ton of coal depends upon leases on lands, taxes, insurance, labor, maintenance, power and other costs too numerous and too well known to mention.

As the price of coal is largely based upon supply and demand, competition must be a determining factor, especially under the present market conditions.

It is therefore necessary that every item of cost be carefully scrutinized and efforts be exerted to bring down these costs in order to realize a reasonable profit on the sale of each ton of coal. Certain mining costs are fixed and cannot be changed whether the mines are producing or are idle. Actual operating costs, however, can be lowered if careful attention is given to those subjects which are a source of expense when the mines are in operation.

Power costs for hoisting, ventilating and pumping can seldom be changed, but power for locomotive haulage and cutting of coal can be materially reduced if given the proper consideration.

Many mines lose from 50 to 60 percent of the power generated for locomotives and cutting machines, entirely due to inadequate feeder systems and neglect in keeping feeder lines and track bonds in repair.

When starting a new mine the power line for locomotives and cutting machines usually consists of a No. 4/0 trolley wire and track return. As the mine workings extend and more power is required, additional copper feeders are installed, without due consideration for the economical transmission of power.

Small mines generally install one or two generating units and as the workings advance an attempt is made to supply power over the greater distances by adding feeder lines. Instead of adding additional copper to reach distant mine workings and thereby increasing the loss of power it is often possible to relocate the sub-station nearer the new center of load.

C. H. Matthews

Since the advent of automatic control for mine sub-station equipment the machines can be located at any desired place in the mines, the A. C. feeder lines entering from the surface through old workings, airway or borehole. The cost of moving the sub-station and the investment in automatic control is soon saved by the lower power and labor costs. It is not always necessary, and in most cases it is not desirable, to have all converting equipment in one place so that two or more stations located some distance apart may be more economical. Most power contracts include a demand charge, generally known as a ready to serve charge, so it is imperative that the peak loads be kept to a minimum in order to reduce the monthly power bill.

Where the hauls are short and grades light the use of storage-battery locomotives have proven successful for gathering work. As the batteries can be charged at night during off-peak loads, the power demand will be somewhat lower than when all gathering is done by trolley-type locomotives.

Storage-battery locomotives operate at a speed of 3½ miles per hour at their rated draw-bar pull, and as this speed is fairly well maintained over the working day the gathering work is not delayed due to low voltage.

Storage-battery locomotives are not suitable for all conditions of service, so that the trolley locomotive is needed where heavy loads, longer hauls and adverse grades are encountered.

Since speeds of 3½ miles per hour have proven satisfactory, it would seem that lower speeds than the usual 6 to 7 miles per hour could be successfully used on trolley locomotives for gathering work.

It would be difficult to determine the exact speed at which trolley-type gathering locomotives should operate, but it is safe to assume that they should not be rated at a speed as low as 3½ miles per hour, since they are located near the center of a heavy cutting-machine load and consequently operate at voltages below their normal rating. The higher speeds due to handling light loads might in some places partly compensate for the low voltage so that the average speed could be about the same as a storage-battery locomotive.

When considering the voltage conditions under which the majority of gathering locomotives operate it would seem that a speed of 4 to 5 miles per hour at rated voltage and draw-bar pull would give the best operating service for the majority of conditions.

Gathering service requires frequent starts and stops, due to the short hauls and switching of cars. A locomotive designed to operate at speeds of 6 to 7 miles per hour seldom attains full speed in switching operations, so why is it necessary to employ such high-speed machines when these speeds are not utilized? A slower-speed locomotive can be quickly accelerated, and if the motors are properly designed, mechanically as well as electrically, the current required

*Westinghouse Electric & Manufacturing Co.

for acceleration and balanced running will not exceed the continuous ampere rating of the motors. A low current in the windings means cool-running motors and consequently less chance of burn-outs of armatures and fields due to low voltage.

During the short runs when gathering, the high-speed locomotive seldom gets up to full speed and in accelerating requires a high current demand. The slow-speed locomotive will accelerate quickly to full speed and will actually run at its balanced speed when making its trip.

The use of slow-speed gathering locomotives results in lower maintenance on equipment, reduces derailments and accidents and maintains the same output of coal with a lower consumption of power than when operating at the higher speeds in general use at the present time.

It does not seem possible that a definite number of cars of coal can be hauled over the same tracks at a lower power consumption with slow-speed than with high-speed locomotives. The higher speed locomotive pulls high peaks and spends a greater part of its time in acceleration and retardation, whereas the slow-speed machine comes up to speed quickly and takes no longer time in which to make its trip. The result should be the same power consumption. This would be true if the losses in power transmission were neglected, but the higher-speed locomotive draws a heavy current during acceleration and has its starting resistor in circuit a longer time, whereas the slower-speed machine requires a lower current demand and thus reduces the losses in transmission.

This is not a perpetual-motion problem but one of practical interest to every mine operator, as a reduction in power and maintenance assists in lowering the cost of mining. The higher-speed locomotives requiring a heavier demand on feeder lines reduces the voltage, which slows up production at the face. Cutting machines will produce the coal if the proper voltage for the motors is maintained, but if the voltage is reduced by excessive locomotive demands the result is a slowing up of the output of coal; besides, the low voltage causes excessive repairs to cutting-machine motors.

The question of slower speeds for main-haulage locomotives can be compared on a somewhat similar basis as for gathering service, especially in mines where the feeder lines are inadequate for the service and the load is some distance from the sub-station.

The higher-speed haulage locomotives require large motors, and the demand on the feeders and sub-station may cause such a loss of power and reduction in voltage that the actual speed of the locomotive may not exceed the speed of a machine with smaller motors geared for a slower operating speed which require a much lower current demand. These questions are of such vital importance that a careful consideration should be given to the design and installation of feeder lines, location and size of sub-station equipment and design of locomotives, so that the most economical operating results will be obtained.

PERMISSIBLE STORAGE-BATTERY LOCOMOTIVES

THE Bureau of Mines has approved for use in gaseous and dusty mine atmospheres a 7-ton type "WOG" storage-battery locomotive manufactured by the Ironton Engine Company, Ironton, Ohio, to which approval No. 1503 was assigned. This is the fourth locomotive to be approved by the bureau. Descriptions of the three previous investigations will be found in Serials 24493, 24744 and 25815.

Each approved locomotive has a probable life of several years. During its life the locomotive may be operated in explosive atmospheres where failure of any of its safety features may involve the safety of every man in the mine. Therefore, as long as the approval plate remains on the locomotive the Bureau of Mines, as well as the manufacturer, is interested in the condition of the locomotive in all matters pertaining to its safety.

EXPLOSION HAZARDS OF PULVERIZED COAL

AN investigation of the explosion hazards in industrial plants using pulverized coal as fuel, which has been conducted by the Department of the Interior, through the Bureau of Mines, for the past several years, has been completed. Practically all the important plants using such fuel were visited, and the installations closely studied for safety conditions and the means employed for eliminating possible hazards. In some plants the Bureau of Mines engineer was able to point out dangerous conditions, and practical changes for their abatement. The results of this research show that the causes of an explosion hazard are similar to those from coal dust in mines. Means of combatting them are to prevent clouds of coal dust from getting into the air, and to eliminate possible sources of ignition. A report giving the result of this investigation will be issued by the Bueau of Mines within the next few months.

COAL STORAGE CUTS PRICE

THE cooperation of industry in the summer purchase and storage of coal is urged by Secretary of Commerce Hoover in a letter to various national and state trade associations. In his communication Mr. Hoover points out that coal is at its lowest price during the summer and that cooperation in his plan will result in cheaper coal through more regular operation of mines. The secretary says:

"During 1923 the railways through the cooperation of the manufacturing and distributing trades and the coal operators and distributors were able to handle the national coal traffic in a most efficient manner without car shortages. This was accomplished to a considerable degree by cooperation among the trades for the purchase and storage of coal during the summer season. As you are aware, the great danger point of traffic congestion is the fall season when the combined crop, winter goods and household coal movements have always, except through last year's cooperation, combined to create a car shortage.

"The fall car shortage always has the effect of increasing the price of coal and of seriously disturbing the whole economic machine. Security lies in repeating the storage performance of last year, by the manufacturers of the country taking reserves of coal during the months of May, June and July, thus foregoing the necessity of coal shipments during the peak period in competition with the household movement. Outside of strike years these summer months are universally the period of lowest bituminous coal prices.

"We also have a national problem in the long view of securing cheaper coal by maintaining more regularity in the production of our coal mines through planing out its seasonal fluctuations. This can only be brought about if the consumers are willing to store coal during the low production season.

"There is, therefore, every transportation and financial reason for storing coal during the next few months in preparation for the autumn need. It would be a contribution not only in the interest of the consumer but of the railways and the coal industry if we could this year produce the same successful results that your association so materially assisted in bringing about last year.

"I am, therefore, asking that your association should actively interest itself in bringing these matters to the attention of the large coal consumers from the point of view of their personal interest as well as a contribution to the mutual good of American business."

THE EDUCATION OF A MINING ENGINEER

Instruction In Fundamentals Of Business Law, Accounting And Cost Analysis Urged—Must Appreciate Importance Of Human Relations — Ability To Cooperate Important Asset

S. J. KIDDER*

WE all know that a mining engineer has to do with the discovery, production and disposal of mineral substances. It would seem that his education must necessarily prepare him in some measure to deal adequately with these subjects. No sooner does he undertake any one phase of his work than he comes in contact with other men, and sooner or later, this contact will be with men of broad fundamental training and background and if the engineer is to be capable of meeting these men on anything like an equal footing his own training must be equally broad.

S. J. Kidder

OBJECTS SOUGHT BY EDUCATION

In casting about to find the main objects to be sought for in the education of a mining engineer, that interesting autobiography, "The Education of Henry Adams" furnishes an excellent clew. It states that, "the object of study is to fit young men, in universities or elsewhere, to be men of the world, equipped for any emergency; and at the utmost, the active-minded young man should ask of his teacher only mastery of his tools. He views the young man himself, the subject of education, as a certain form of energy; and the object to be gained is economy of force; the training is partly the clearing away of obstacles, partly the direct application of effort." The above would seem to hold good in the education of a mining engineer as well as in the education of anyone else.

The report of the committee on Technical Education of the Mining and Metallurgical Society of America, published in September, 1921, points out that in final analysis: "Character, human sympathy, vision, clear thinking and force are, after all, the alphabet that spells success for an engineer and for a citizen, and afford that personal satisfaction which is the chief goal of existence."

Henry H. Knox in a brief article on Technical Education and National Character,* quotes the remarks of Admiral Sims made after his war experience, "I have been inclined to suggest that it would be well, in training naval officers of the future, to combine a college education with a shorter intensive technical course at the Naval Academy. For these college men have what technical academies do not usually succeed in giving—a general education and a general training, which develops the power of initiative, independent thought, an ability quickly to grasp intricate situations, and to master in a short time almost any practical problem."

BROAD FUNDAMENTAL TRAINING

The reason then for the insistence on a broad fundamental training for the mining engineer, in addition to instruction in general engineering subjects and specialization in mining and metallurgy, is that the engineer may be prepared not only for the highest positions in his own profession but also that he may be prepared to take his place in public affairs when he is called on to do so, with credit both to himself and his profession.

Harlan Fiske Stone, the new attorney general, has made a similar plea with respect to legal education. In his 1921 report as dean of the Law School of Columbia University he said, "The American bar has been content to leave the problems of legal education and the improvement of the bar to the ministration of the 125 or more law schools of the country, good, bad and indifferent, without the active interest and cooperation which ought to exist between an organized profession and the educational institutions which train its members.

"A not unnatural result has been the growth in number of those who apply for admission to the bar with a wholly inadequate education, both general and professional. The superiority of the English bar as a whole over our own, despite its inferior legal education, is due in large measure, I believe, to the fact that most of its members are educated at universities, and they come to their profession with an intellectual equipment and a moral and educational background wholly lacking to the great number of youths who in this country are annually admitted to the bar after they have completed a meager high school education."

There are in this country 129 schools† offering professional courses in engineering, of these 38 have regular courses in mining engineering and allied subjects.‡ Pennsylvania leads with five, while California, Montana, Nevada, Ohio, Oklahoma and Washington each have two, while the 19 others are scattered over as many states.

RECOMMENDATIONS

The Committee on Technical Education of the Mining and Metallurgical Society already referred to, prepared a file of the catalogs of these various mining schools, and made a comparison of their courses together with numerous recommendations which are worthy of detail study by those responsible for the selection of the subjects taught in any mining school.

Considering the instruction in general groups, the committee has recommended that as much as 40 percent of the total time in a four year course could well be devoted to the fundamental subjects of mathematics, physics, chemistry and mechanical drawing.

General engineering subjects embracing geology, mineralogy, surveying, civil, mechanical and electrical engineering were allotted 30 percent of the total time.

To specialization in purely mining and metallurgical subjects the committee suggested devoting not over 20 percent of the time believing doubtless, as suggested by Admiral Sims, that specialized technical courses should be shorter and more intensive.

The committee has left then only 10 percent of the time in a four-year course for thesis work, English, history, foreign language, economics and physical training. This amount of time seems inadequate for these important subjects if the engineer is to be fitted for the highest positions in his own profession and to take whatever part he may be called upon to fill in public affairs. Would it not be better to urge the college course in combination with the short intensive train- (*Continued on page* 334)

*Address at the meeting, New Mexico Chapter, American Mining Congress, Socorro, New Mexico, April 25, 1924.

*Mining and Metallurgy, December, 1922.

†O. S. Lyford, "The Engineer As a Leader In Industry." Paper presented at meeting of Society for Promotion of Engineering Education, Ithaca, N. Y., June, 1923.

‡E. & M. J. P., Vol. 115, p. 158.

ROCK DUSTING OF COAL MINES

(*Continued from page* 297)

rock-dusted so there will be no more than 50 percent combustible matter present at all times. The explosibility tests of some coals may indicate that there should be 70 percent of incombustible material.

9. Following is an estimate of the initial cost of rock-dusting equipment for a 400,000-ton mine on a twenty-year basis:

Pulverizer	$1,500.00
Crusher	500.00
Elevators (two)	350.00
Bins (two)	150.00
Motor and accessories (20 H. P.)	350.00
Sampling and analytical kit	75.00
Distributor	500.00
Auxiliary car	100.00
Building	1,800.00
	$5,325.00
Total installation cost	$5,325.00
Interest at 6 percent for 20 years	6,390.00
Amortization (20 years)	5,325.00
	$17,040.00
Cost per ton on an 8,000,000-ton (or 20-year) basis .. (per ton of coal) ..	$0.00213

Following is an estimate of operating costs:

Crushing and pulverizing (per ton) ..	$1.00
Distributing do....	1.55
Total do....	$2.55
Approximate length of entries to be dusted in an average 400,000-ton-per-year mine (miles) ..	50
Average amount of dust required for each mile (tons) ..	1.8
Amount required for one dusting do....	90
Amount required per year do....	360
Cost at $2.55 per ton	$918.00
Cost per ton of coal on yearly production of 400,000 tons	$0.0023
Installation and depreciation	0.00213
	$0.00443

OCCURRENCE, CHARACTERISTICS AND BEHAVIOR OF COAL DUST

(*Continued from page* 294)

density, it becomes an active explosion hazard in the presence of an igniting medium. Such a suspended cloud, when ignited, possesses many of the qualities of a gas although it appears to propagate an explosion wave faster than does a methane explosion. The mechanics of a coal dust explosion are better known than the phenomena, and less is known of the chemistry of the reactions that take place.

To insure their forming a dust cloud of proper density for ignition by the flame of a black powder shot, different coal dusts require an impulsive or concussive air wave of different degrees of intensity, and the stronger the impulse the more likely is the explosion to propagate. The size, shape and character of the room, entry or working place also determine the relative ease of the production of an explosion that will be self-sustaining. The initial velocity must become accelerated if the explosion is to propagate. After a dust explosion has gotten under way, the explosion wave will carry in front and with it an excess of coal dust; in this manner the flame may be carried over and through long stretches of wet zone in some parts of a mine. Turns, bends and obstructions, such as mine cars, cause a turbulence of the air and this increases the violence of the explosion. Velocity of coal dust explosions, as determined in the experimental mine, ranges from 100 to over 4,000 feet per second. A velocity of 300 feet per second, or 3.4 miles per minute, is a relatively slow explosion.

The sources of ignition of coal-dust clouds in mines include open-flame lamps, electric arcs, and flame from black blasting powder or high explosives. A blown-out or overcharged shot of black blasting powder is the most dangerous source, since it not only furnishes the necessary heat and flame but the shock wave stirs up a cloud of dust which the flame may ignite.

If coal dust explosions are to be eliminated as causes of horrifying mine disasters, more attention must be given to the curtailment of the sources of ignition. This may be accomplished by the employment of devices already available on the market, such as closed lights, approved electrical machinery for use in gaseous mines and permissible explosives. As a further precaution against the propagation of an explosion the coal dust should be treated with rock dust. The use of water has proven ineffective and gives a false security unless the water is applied in such quantity and at such frequent intervals that the cost becomes excessive as compared with general rock dusting.

ROCK DUST VS. WATER

(*Continued from page* 298)

explosion about 90 percent. Shale or limestone has a higher specific gravity than coal, but for all practical purposes rock dust is suspended in air, carried along by the ventilating current and deposited similarly to coal dust. It might be added that the angle of repose of rock dust is extremely high as compared to coal dust. Once the rib, timber, etc., is air-blasted and then rock-dusted, coal dust will not lodge on the coating of rock dust, but will roll to the floor, which usually contains a relatively high percentage of incombustible material. Rock dust is relatively so fine that it will not be loaded out with the so-called "company coal."

Rock-dusting has many added advantages; for instance, about 90 percent of the light underground is absorbed by the coal. Rock dust, and particularly that prepared from limestone, greatly increases the illumination and consequently increases the efficiency of the workman and decreases accidents. Rock dust is an efficient fire-fighting material and is no doubt much safer to use than either water or chemicals. It is also believed that it has special merits as a stemming material for shot-holes as compared with clay and other inert substances.

If a mine operator rock-dusts all passageways up to and including room-necks; uses permissible explosives, electric cap lamps, and other equipment; maintains efficient ventilation; endeavors to prevent the "manufacture" day by day of fine coal dust by using water sprays on the cutter-bar while undercutting; wets down the face before shooting; uses solid body cars; and with automatic sprinklers wets both empty and loaded trips, he has done everything reasonable to prevent a mine explosion. It is then a matter of supervision, discipline and control of the human equation.

In a more detailed study of the relative merits of rock-dusting and watering, reference should be made to Bulletin 167 of the Bureau of Mines, entitled "Coal-Dust Explosion Tests in the Experimental Mine, 1913 to 1918, Inclusive," by Messrs. George S. Rice, L. M. Jones, W. L. Egy, and H. P. Greenwald. This bulletin can be secured for the price of $1 from the Superintendent of Documents, Government Printing Office.

WEST VIRGINIA'S PROBLEM IN INDUSTRIAL COOPERATION

Theory Of Compulsion Rather Than Cooperation Too Prominent—Splendid Opportunity For Operators To Demonstrate The Value Of The Shop Committee Plan—Depression In Coal Industry Calls For Cooperation Of Capital And Labor

By JOSIAH KEELEY*

AS A MEMBER of the Division of Industrial Cooperation of the American Mining Congress, I should be able to report something constructive even if not of national interest. It would be expecting too much of any one member to speak accurately for any very wide area. I think I can give the facts relative to industrial relations in Kanawha District of Southern West Virginia, and I probably know as much about the rest of the state as they do about us. If newspaper and magazine stuff is any criterion, this little section is to some extent responsible for the nation-wide movement for better industrial relations. Without admitting any considerable amount of iniquity so imputed, we recognize the power of the press and to that power we now appeal. If Kanawha District has contributed nothing more than a national desire for the truth about industrial relations, that is something.

The Division of Industrial Cooperation is not the advocate for any one system, although an earnest investigator of all systems that give any promise of working. After all, industrial friction is not necessarily inherent in a system. Almost any system will work if a sufficient number of people want it to, or if the right people wish it. West Virginia has had both extremes, operator dictation and miner dictation, though the general public has seen fit to believe that West Virginia as a whole presents a system of feudalism. In these two extremes, the one is built up on the assumption that any collective request from the employes is treason, while the other enunciates the avowed principle that the miner is entitled to the "full social value of his labor."

A typical instance of the first system came under my observation a few years ago when a thrifty miner had saved money, leased a small acreage, and was operating. As a "fellow operator," he discussed knowingly with me his labor problems. He said, "When I started runnin' a coal mine I made it a rule to never give my men nothing they asked for. Sometimes what they wanted was all right, but I never broke the rule. When they complained of the houses, I would say, 'When them houses was made, there was holes cut in the side for the which to come in by and to go out by, and when them houses don't suit you, you just leave by them holes,' and they all just loved me like a brother." It was plain to be seen that he felt himself a real operator, and there was much evidence to prove that his system worked.

Typical of the other system under which the employes had practically taken over the works, one of the union officials was asked just what was meant in his constitution by "the full social value of his labor." He unhesitatingly answered, "It is our policy to increase our demands until we own the mines." Both of these men were interpreting a system as they saw it, but a monkey would never sit up and eat with a fork unless he had seen someone else doing it. It is a little disconcerting to note that both of these systems seemed to be working reasonably well from the viewpoint of the pacifist.

It has been explained in West Virginia that the reason we cannot get along with a union is because we won't let it have its own way, which is entirely possible, but it has always seemed to me to lie deeper than that. The theory of compulsion rather than cooperation has too prominent a place in contracts. The attitude of two armed hosts drawn up under a kind of armistice is not industrial cooperation. On the other hand, the attempts of many nonunion operators to substitute elaborate systems of welfare work for wages is patently weak, but not so stupid as the policy of the United Mine Workers of America in having nothing to do with uplift programs. When they demand an American standard of living, based on nothing but a wage scale, and keep their membership on a raw meat diet rather than encourage participation in movements for betterment, it is altogether too suggestive of German frightfulness.

There are plenty of miners fully capable of uplifting their own people, and many who would take up this kind of work in the community if not frowned on by their own organization. All the service a company need render its employes in this respect is a reasonable liberality in buildings and space and a readiness to cooperate. If an operator's presence and leadership is appreciated and sought, he owes much of his time to the community. If such leadership tends to destroy the initiative of the men, there are plenty of other ways an operator can show his interest and approval. The best way for a union to prove that it does not stand for a program of violence is to show some interest in those camp activities which are inconsistent with violence.

After ten years of unionism in Cabin Creek we saw our men gradually dominated by bootleggers, gamblers and crooks. Store robberies and gun cases were impossible of prosecution because of the supposed sacredness of the union oath. The usual philanthropic secret orders were absorbed by the locals. Secret combinations were resorted to by the men to extort secret bonuses from the foremen. When these fraudulent rates were discovered, the union leaders upheld them as "having been established by practice." Strikes were called for any reason, or for no reason. Then the "Mingo March." It has been represented that this armed uprising was due to the oppression of nonunion operators, but the looting, the murders, and the terrorizing was all done in union territory; and the outrages committed against union operators were against men who had given them recognition and cooperation for ten years. It was a manifestation of sovietism purely and simply and not without the suspicion of a directing head. The claim that this industrial army started to liberate the industrial serfs in Logan County was not believed even by the men themselves, many of whom were forced away from their homes by threats and at the point of guns. Many of these men had worked in Logan and had paid their $25 fine for working in a nonunion field. A fact which is not generally recognized outside of West Virginia is that, at that time, practically all of West Virginia was organized except those counties of Mingo and Logan, and the men in those counties were what the miners call "natural scabs." In other words, that was the only sanctuary for men who had been expelled from the union for ninety-nine years and fined $1,000. Mingo and Logan were nonunion by the very nature of things. Probably there was strenuous opposition by the operators in the beginning, but by this time the process of segregation and natural selection had gathered from the corners of the coal mining world men who were fugitives from union persecution or from union justice. Every time a union sympathizer showed up and was expelled, he came to Kanawha. Every time a miner transgressed the union law or absconded with the union funds, he fled to Logan. With this element, together with a goodly class of industrious men who always avoid industrial troubles, Mingo and

*General Manager, Cabin Creek Consolidated Coal Mining Co.

Logan presented an almost impregnable fortress of nonunionism, a Canada for union slaves, and the way they armed themselves and prepared to meet the oncoming marchers speaks for itself.

With this climax to ten years of unionism, the majority of the operators who had been held up by masked gunmen and chased about in their night clothes decided to dispense with the luxury of a union. The last two years have been the only two in seventeen that I have seen possibilities for industrial cooperation. After all, the operator is the only one who knows what the business will stand in the way of wages. The United States Coal Commission was probably right when it pointed out that it was unfair to the miner to use a wage differential to put coal companies on a competitive equality, but when neither the quality of the coal nor the freight differential will do it, the miner in these less favored districts has the option of sitting down and waiting for prices to come back, going to a field where the wages are higher, or of working on a reduced wage in the meantime. The coal business is not the only overdeveloped industry. The public road work in Kanawha District has expanded until that kind of labor is hired by the state for 28 cents and 30 cents per hour, and yet there is no public howl and no government investigating committees are coming around to see how these men live, nor does Washington suggest that the differential is unfair as between road work in West Virginia, Illinois and California.

I have no illusions about the practicability of operating open-shop, or nonunion, mines in our district. Whenever business conditions warrant the union in claiming the credit for advancing wages, the organized minority will again call for followers, and we will have the option of facing a strike for union recognition, or of again trying to cooperate with the United Mine Workers. Personally, I shall advise our men to stay out of it as long as possible, or until that organization gives some promise of industrial peace. Our best plan might be to try to civilize the United Mine Workers of America. I am a strong believer in utilizing what we have in place of multiplying organizations. Our government gives autonomy to the islands of the sea in a discretionary way, and without assuming to intimate an exact parallel in industrial powers perhaps it is not expecting too much to ask guarantees against Mingo marches and Herrin massacres in exchange for industrial autonomy. The system has not worked in the past except to build up a power for industrial war.

The Division of Industrial Cooperation of the American Mining Congress is open-minded I believe as regards labor unions, but it is particularly interested in any other substitutes that are being tried in the interest of industrial peace. There is probably no reason why shop committees and local organizations of employes could not meet the local conditions and still affiliate with a national organization of crafts, but at present all local organizations are to the state and the nationals as the islands of the sea.

Friends of industrial peace are anxiously watching to see non-union companies present some system of committees and workmen's councils in justification of their contention that they are not against collective bargaining on general principles. There are two very powerful agencies working against any kind of local organization in non-union mines: The power of the United Mine Workers of America is far reaching, and they are exceedingly jealous of anything tending to break their monopoly. By a system of publication, fines and social ostracism the least offender is a marked man. The exigencies of the coal business cause a tremendous labor turnover, often compelling miners to hunt work from field to field. They never know when they may need the union card. So, when the question of an independent organization comes up it is treason against the United Mine Workers, and few wish to be targets by reason of accepting leadership in a secession movement. In the non-union fields they seem to prefer to work on, content with tacit understandings and temporary spokesmen rather than openly flaunt the power of the mine workers. Again, from the operator's standpoint, it is much easier for the United Mine Workers to take over a unit that is already organized than to organize. I have in mind a man who is now president of a district. Some years ago the men in a certain field decided that they would have an organization of their own, signifying it by the signing of over 75 percent of their numbers. He helped work it up and accepted the presidency. In less than a month's time he had turned it over to the United Mine Workers and accepted the presidency of the whole district. I take it there was nothing dishonorable about either transaction as the men approved, and the companies were interested mainly in having an agreement with their men. Of course the change was brought about by influences eminating from the United Mine Workers, and just what they were I am not able to say with certainty.

From the standpoint of the public they are entitled to a sufficient variety of shop and camp systems to break the monopoly, though cheap coal at the mines can not help them much with exclusive franchises in the markets. It is to be doubted if the public, other than the big industries, have shared greatly in the recent cheap coal.

The United Mine Workers today is a chastened organization. There are more non-union mines operating today than for the past ten years. If there is anything in the open-shop practice, now is the time to prove it to the miner and to the public. If the United Mine Workers want to gain back its lost ground and its prestige, now is the time to stop hammering on power over wages and pay some attention to peaceful methods and to respect the facts of the coal industry. In the meantime our Division of Industrial Cooperation is enjoying the satisfaction of an unprecedented period of industrial peace, if not exactly cooperation, but there is a bit of suspicion that it is a case of fun for the boys and death for the frogs.

The latest effort of the Philadelphia & Reading Coal & Iron Co. to inculcate industrial peace in the minds of its men is to interest them in matrimony and to this end the company has embarked on an extensive home-building campaign to provide houses exclusively for newlyweds.

At one of its extensive mining centers, Branchdale, Pa., two long rows of modern houses are being built. Each house has modern fittings, a yard, and rentals are lower than for neighboring houses. Every house in the group has been rented before completion by newly married or prospective June couples. The motive, of course, is to discourage young miners from drifting, although those experienced in the handling of mine labor say the effect will be to reduce strikes and uprisings, since most of the restless element comes from the ranks of bachelors.

OIL SHALE BIBLIOGRAPHY

Alderson, Victor C.—Oil Shale in the United States; Mountain States Mineral Age, April, 1924, p. 19.

Bellis, Joseph.—Oil Shale Pioneering Since 1909; Mountain States Mineral Age, April, 1924, p. 15.

Day, David T.—Oil Shale of Brazil. New Shale Development in Washington. Catlin Markets Shale Oil Fuel. Mineral Oil from Shale in Sweden; Oil Engineering and Finance, April, 1924, pp. 232-234.

DeBeque, George R.—The 1924 Outlook for Oil Shale; Mountain States Mineral Age, April, 1924, pp. 12-14.

Molten Metal as a Source of Heat in Retorting; Petroleum Times, April 19, 1924, p. 570.

Potter, D. D.—Oil Shale Our Economic Salvation; Mountain States Mineral Age, April, 1924, pp. 11-14.

Ralston, R. P.—Oil Shales as an Investment; Mountain States Mineral Age, April, 1924, p. 12.

Russell, W. C.—Oil Well Men Buying Shale Land; Mountain States Mineral Age, April, 1924, p. 14.

Winchester, Dean E.—Some Recent Developments in Oil Shale Research; Mountain States Mineral Age, April, 1924, p. 13.

ANNUAL MEETING BOARD OF GOVERNORS WESTERN DIVISION AMERICAN MINING CONGRESS

Grass Valley Meetings Lay Foundation For Important Sessions At Sacramento Convention — Prominent Metal Producers Attend — Department Of Mines Endorsed—California Gold Producers Conference

By Bert F. Hews

ADOPTION of a definite and comprehensive program of western mining problems for presentation before the twenty-seventh annual convention of the American Mining Congress in Sacramento the week of September 29 marked the annual session of the Board of Governors of the Western Division of the Congress, held June 9 and 10 at Grass Valley, California. In many ways it was the most important meeting yet held by the governors. At its executive sessions, the grave situation

Robt. E. Tally

of western metal miners, particularly the producers of precious metals, was discussed thoroughly. It tackled real problems, and drew up a program of things which must be done to restore mining of western metals to a normal basis.

These are the vital matters which the Western Division governors will bring before the fall convention for consideration and action:

Creation of a federal department of mines, with the formation of state departments of mines to work in cooperation with it and to coordinate state activities affecting the mineral industry.

Stabilization of the mining industry.

Conservation of standing timber in the mineral districts for mining purposes to avoid long hauls of mine timbers.

Methods of attracting new capital to the mining industry, particularly in making known the West's undeveloped mineral resources.

Modification of the income law clauses covering mineral discoveries.

Adoption of "high-grading" laws in all western states, similar to the one now in force in Colorado.

While not made a part of the formal program, it was clearly indicated that the western governors will be found supporting any action looking towards modification of existing blue-sky laws. Robert E. Tally of Arizona, A. G. Mackenzie of Utah, George A. Stahl of Colorado and Emmet D. Boyle of Nevada were appointed as a committee to make a study of the mining conditions in the West and then submit more exhaustive recommendations for the stabilization of the industry.

Governors Attending Session

Those attending the Western Division session were: Chairman Robert E. Tally and Secretary W. B. Gohring, both of Arizona; A. G. Mackenzie of Utah; George A. Stahl of Colorado; Emmet D. Boyle of Nevada; Secretary Henry Reeves of the Nevada Mine Operators' Association and John A. Fulton of the Mackay School of Mines, Nevada; Secretary J. F. Callbreath of the American Mining Congress. William Word, Montana governor, and Edwin Higgins, California governor, were prevented at the last moment from attending. Dean Frank H. Probert of the College of Mining at the University of California, Berkeley, was in Grass Valley during the session and took an active part in the public discussions.

An outstanding feature of the session was the hospitality of Nevada County and the remarkable impression made on the visiting governors by the beauties of Grass Valley and Nevada City. At the luncheon given the visitors at the Bret Harte Inn, Monday, by the Department of Mines and Mining of the Sacramento Chamber of Commerce, Secretary Gohring aptly said:

"I never knew before that a miner ever had to work in a paradise like this. All my experience has been in the Southwest, where our mines are in a rugged country of barren wastes, where your neighbors are likely to be a family of rattlesnakes. I cannot imagine how anyone ever leaves here. All I want to do now is to get a job here, and if I can I think I'll stay."

Or, as Chairman Tally said at the public meeting Tuesday afternoon to the welcome by Judge Frank T. Nilon, presiding:

"I think about the best way of expressing what we think of your town is that, first, it's historic; second, it's modern, and, lastly, it's a model. That's quite a combination. Providence — rather God — has been more than good to the people of this district. He has given them wonderful ore bodies. He has also given you the most ideal surroundings and the most beautiful scenery of any mining camp in existence. He probably had in mind that this should be some ideal for the mining communities elsewhere to look to, something we might all strive for in making our mining camps attractive. The conditions which you have here have impressed me that we from the outside have something to model after. We can be inspired and make our own places more attractive."

A. G. Mackenzie

In his address of welcome, Judge Nilon had pointed out that miners employed in the Empire mine, down 6,200 feet on an incline, and the North Star, with a 6,600-foot incline shaft, did their daily work below sea level, yet ate their dinners 2,500 feet above sea level. He also called attention to the fact that the underground workings of the Empire total 44 miles.

It is true that Grass Valley, where gold quartz mining in California originated in 1850, is one of the beautiful gem cities of the West. It and Nevada City nestle in the lap of the lofty Sierras, with snow-clad peaks ever visible, while luxurious orchards of oranges, pears and peaches cover the slopes where once thousands of placer miners washed out fortunes in gold. Timber-clad ridges encircle both communities, and there are scarcely any of the scars that mark the usual camp.

Nevada County, famed for its hospitality, which has continued down through the years from the pioneer days, unchanged, made the stay of the board of governors and visiting mining men delightful. Monday evening they were the guests of the Department of Mines and Mining of the Nevada City Chamber of Commerce at a sumptuous banquet in the

National Hotel of that city, followed by the showing of "The Story of Gold—'49 to '24," which was filmed in the Nevada City-Grass Valley section. Mining men present were greatly interested in the pictures of the new automatic stoping machine invented by George W. Starr, managing director of the Empire mine, which drives eight drills simultaneously against the face and pulverizes the rock without using any powder.

Tuesday evening there was the banquet of the Nevada County Development Association in honor of the visitors in the Bret Harte Inn, Grass Valley, with Mayor M. J. Brock of that city presiding. Dean Probert and Secretary Callbreath were the speakers, and their remarks will be dealt with later. The governors were taken to the Empire and North Star mines during their stay in Grass Valley.

Gold Producers' Conference

No less important than the Western Division session was the California Gold Producers' Conference, called for Tuesday afternoon by the Sacramento department, with the Board of Governors cooperating. In many ways this was an epochal meeting in the history of California mining. It was one of the most constructive and forward-looking sessions of mining men ever held in the state. It dealt frankly and forcibly with the ills which beset the mining industry today and proposed practical remedies.

If all the members of the National Congress could have listened to these addresses, it is certain that legislation to aid the gold producer, as well as the miner of other metals, would be quickly passed and the irksome restrictions under which the mining industry operates today would have been removed.

It is unfortunate that space does not permit the reproduction of the talks, for never before has the case of the gold producer been so well presented. The best that can be done is to give excerpts from the principal speeches of the conference, which was presided over by Judge Nilon, of Nevada City. These excerpts follow:

"Ills of Mining Industry"

Chairman Tally.—"The trouble is that we are apt to go after our problems and try to solve them single-handed. The coal men try to solve theirs, the silver producers theirs. If there was an understanding and we all got together we could get somewhere. And, on top of this, there is a lack of governmental assistance. . . . Present world conditions will soon change and new mines must be found to meet the growing demands for metal, or the United States will depend on foreign production for its metals. Surface showings in this country are becoming few and far between, and new metals must be found or substitutes must be devised. It is the duty of the mines to conserve their resources as they have been eliminating waste and trying to develop by-products. Refining also warrants some consideration.

"Statistics show that one good mine is developed out of 22,000 locations made. Large amounts of money are expended by the owner of a mine before it is capable of producing profitably. It is a story of hardships, of endless struggles, of going through a period of changes which test a man's strength and patience. A mine changes hands frequently before it finally gets into the hands of those who can develop it properly and profitably. It shows that mining is not profitable unless the owner gets larger returns than he does in the more secure investments. Capital at present is not interested in finding and developing new mines. Surtax rates should be reduced. We need the cooperation of the government. The numerous depressions of the industry are discouraging the better class of labor. Wage reductions and shutdowns have been forced upon us, with the result that efficient laborers leave for other fields at the first opportunity.

"There is no doubt that the future requires a good supply of metals. But the demand cannot be met unless the government cooperates. Both labor and capital are becoming prejudiced against mining. This country will lose its preeminence in metal prdouction unless something is done. Let's all get together and impress the government, the public and all concerned with what the industry means to the country."

"Needs of the Gold Industry"

William J. Loring, past president, A. M. C., and managing director of the Carson Hill and Plymouth gold mines.—"Believe in the gold mining industry and we'll bring it back more quickly than if we sit around and worry about it. We want to have faith that we are engaged in a worth-while industry and must be masters of it. Our mines today are growing deeper and it requires greater skill and more equipment than it did in the days when they were shallow. I am glad to say that we have the skill.

"We need a bill that would bar the sale of gold by the government for use in the arts. Let those people buy in the open market, the same as any other commodity is purchased. That will stabilize the market and bring the law of supply and demand into play. The government must stand behind the gold mining industry or you can do nothing. I believe in high wages, but our efficiency of labor is very low.

"I believe in state-owned stamp mills, such as are provided by the West Australian Department of Mines. When a new mining property warrants it, they erect a five or ten-stamp mill, and treat the ore for a fee of only 10 percent above cost. They believe in developing mines over there, because it means more gold. I believe also in giving more publicity to our operations. California is backward in this respect. Some of the best properties will not give out any information. That attitude is all wrong, because it does not give the public any idea of the importance of the work and what it means for the general prosperity. It does no harm to give out information to the investing public. An act ought to be passed by the legislature making it obligatory for every mine to send in a regular report, accompanied by maps, every three months, so that there would be a place where the investing public could get authentic information.

"There is a great need for uniform methods of taxation. I don't believe in the present system. A great deal depends on the assessor and how much he knows about mining. I think it is all wrong.

"There should be a department of mines in every state, as well as a federal department of mines at Washington, with a secretary of mining in the President's cabinet. The only thing is that we want to get a good man for the job and we want to keep him there, working for the industry, with no politics about it. We must not forget, however, about the state department of mines. Every support should also be given the American Mining Congress, which has saved us many millions of dollars while we were sleeping, and to Secretary Callbreath, who is the right man in the right place.

"The Sacramento Chamber of Commerce mining department is the livest organization I know of in California. It is always on the job, stirring up a lot of interest in mining, and something good is going to come out of it."

"Heavy Taxation Burden"

A. B. Foote, Jr., manager of the North Star mine, Grass Valley.—"Our high taxes are not only the direct taxes, which I think are somewhat unevenly assessed, but also the indirect taxes, paid only by certain people. The public service corporations pay all these taxes, our legislators say. I do not think these politicians really believe that. When you come to analyze the whole situation, you will find that only certain classes of people pay the greater part of the taxes, and that those are the consumers—some of these pass these taxes on by charging a little more.

"In the State of California, practically the whole revenue is received from the tax on the gross receipts of the public

service corporations, of whom the water and power interests pay the most. The rate is 7½ percent on the gross income. The state really makes use of those corporations as tax collectors. The lawmakers try to persuade the people that they do not pay those taxes. But the people pay that 7½ percent on the gross receipts, whether they know it or not, because the companies are permitted to add it to the rates.

"The only way that we can reduce our taxes is to make as many people as possible know that they really do pay the taxes and to show that this popular idea that they can tax the rich and that the poor people don't pay the taxes is a fallacy, which it really is. Everybody should do their best to educate the voters to the fact that it is to their interests, even more so than to the corporations, to reduce the expenses of the nation."

Clarence E. Jarvis, president of the Sacramento Department of Mines and Mining, related how, as assessor of Amador County for 14 years, he had worked out a scientific method of mine taxation, known as the "net system," whereby the assessment values are placed on the producing ore bodies, and varied from year to year according to the output of these ledges, instead of assessing all ore bodies in a mine, whether or not they are being worked.

Decline of Gold Production

Lloyd L. Root, California state mineralogist.—"Since the discovery of gold at Coloma in 1848, the United States has produced $4,218,633,000 in gold, of which California contributed $1,763,843,269, or 41.33 percent, of the nation's gold. It has maintained its position as the leading gold-producing state in the Union. During the period 1913-1923, California produced 25.1 percent of the nation's gold output. From 1900 to 1915, the peak year, California's gold production increased annually from $15,863,355 to $22,547,400. Since 1915 there has been a marked decrease in gold production in this state. The 1922 production showed a decrease of 34.7 percent from that in 1915. While the gold production of the United States is increasing as a whole, that of California is decreasing.

"Increasing production cost has been the cause of the gold-production decline. The metal-mining industry during the period 1916 to 1922 received a serious setback due to the increased cost of its products. Yet every phase of the industry received some compensation, one way or another, so that the price of the material was higher per unit, with the one exception—the gold industry. Gold, being the standard of exchange, did not or could not receive an increase in value per ounce.

"Laymen have the erroneous idea that California has ceased to be a gold-producing state and that we have few mines of value left. As a matter of fact, California will always be one of the principal gold-producing states and is capable of producing as much, if not more, gold than it has already. Recent investigation and surveys show that we have alone in our ancient river gravel channels over $600,000,000 in gold, conservatively estimated, that is economically recoverable, and the same holds true for our lode mines.

"There have been few, practically no, new mines discovered in the state within recent years, and the only new production we can look for is the rehabilitation of our old mines, which have been worked by the early miners, who took out what was possible by the old methods of mining. What we have to do today is to apply our new methods of mining and milling, study the geological condition and apply our knowledge of deeper development to these properties, if California is to maintain its present position as the leading gold-producing state."

Emmet D. Boyle

Root then traced in detail year by year the principal causes of the declining gold production from 1916 through 1923.

James S. Hill, in charge of the western division of the U. S. Geological Survey, spoke on the grave need of new geological work in California, and called attention to the survey to be made this summer in the Alleghany district, which he hoped would lead to greater production.

"Necessity of State Department"

W. E. Camp, electrical and mechanical engineer, and chairman of the state department of mines and minerals subcommittee of the executive committee of the Sacramento Department.—"I am glad to note a spirit of optimism here today, a spirit of faith that goes ahead and solves the problems. It came early to our attention in Sacramento that there is a decentralization of efforts in the various agencies that regulate the mining industry in California.

"What we need is centralization. Consideration of this need brought us to the proposal for a state department of mines and minerals. This department would coordinate all these agencies now working separately under one able man capable of working with and for the industry. He would be vested with real authority to enforce the regulations. The department would aim to do for the mining men what the Department of Agriculture now does for the farmers. Oils and structural minerals, as well as the metals, should be included within the scope of the department. There is a big opportunity for good in a state department of mines and minerals in letting the people know the great variety of structural minerals produced in California. It could assist the mineral industry in the stabilization of prices and standardization of materials. The distribution of labor might be studied and intelligently directed by such a state department. Research work is another activity which could be followed with profitable results.

"The state department would probably reclassify mineral lands and resurvey deposits, and gather data on existing mines. It is very difficult for a man to now ascertain anything about the history of a property. He has to take the word of 'old timers' and cannot learn accurately underground conditions. The state department would require the filing of reports and maps of workings, so that in the future those coming from the outside to operate would have something definite upon which to base their plans, as is the case in Australia, Ontario and British Columbia. Capital will go to the place where it is most sure of success."

F. Sommer Schmidt, consulting engineer, Golden Center mine, Grass Valley.—"The idea behind a state department of mines and minerals is based on the principle which is recognized to be the only method in business—concentration of power in one's business. There are a number of agencies now organized to regulate and to help the mining industry. But in their division into separate units their duty toward the industry is liable to be overlooked, though competent men are in charge of them.

"We want one man in charge. We want that man to be a big man, one for whom a salary of $10,000 a year is not too much. He must be a man with hair on his chest, one who can direct a

real fighting unit. For, gentlemen, we need a leader and a champion. We want a mining man who loves us. After all you hear about our wonderful production, we find there is a lack of love for the industry in the halls of legislatures. He could bring together the mining men and go out after necessary capital for developing our rich deposits.

"There's lots of work for this man waiting for him right now. The blue-sky law, for instance—some delicate points there to be studied and worked out. The blue-sky law first hits the prospector—it hampers the development of what he finds. British Columbia affords us a splendid example of how a government can be helpful to the miners. This proposed state department of mines and minerals is not going to be a new department. This department is already in existence, only it is divided and separated so that it cannot function as efficiently as it should. It must have its various activities coordinated through centralization of power and effort."

Colorado's Problems

George A. Stahl, governor from Colorado.—"We have a thorough appreciation of our problems in Colorado. We have assembled data which we are getting into shape in relatively brief form, which we can mail to any inquiring prospector or investor. We have enough inquiries already to assure us there will be more men this year looking in the hills for new prospects than there has been for 15 years. While we are not in shape to back them financially, we have a most efficient experimental station at our school of mines at Golden and we have arranged to have assays made there for them free of charge.

"I am endeavoring to arrange a plan to finance prospectors. I want $500,000 for prospecting in the next two years. I haven't found the way to underwrite this scheme as yet, but I'll find a way and get the money. At Cripple Creek we are making real progress, the miners employed increasing from 200 to nearly 1,200 in two years. The only way to get things done is to be an optimist, one who has faith. The pioneer is one who intentionally directs his steps toward the new and undiscovered country, who visualizes the possibilities for development of natural resources and who has the vision and zeal and faith to carry through."

Nevada's Message

Emmet D. Boyle, governor, from Nevada and former state governor: "The pioneer spirit can still be found in Nevada—it permeates the various mining camps. Mining is the dominant industry of our commonwealth. It is so declared to be in the Nevada constitution and it is so in the hearts of our people.

"The McFadden bill failed because it had no support in the East. The gold producers may as well look the situation squarely in the face. As far as the bankers are concerned, they will never approve any increase in gold production above that necessary to keep up the required gold surplus. There is a big opportunity for legislation which would prevent the breaking up of gold coins. You can obtain it on an arrangement whereby you make your contribution first to the monetary system, but demand that the man who uses gold for any other purpose shall be treated the same as any other buyer who uses a commodity for the manufacture of something for profit.

"We are in competition with those who are intensively organized. You are, with the farmer, the last two remnants of modern civilization which do not invoke the good will of economists. Two things have happened to the basic industries in the last century, both carrying with them the necessity of complete understanding. Both mining and agriculture grew up on an economic basis. The farmer never did receive from the product a fair return for the value of the property he possessed. When the great public resources were thrown open, the farmer seized upon this and acquired lands. He prospered on the unearned increment on his property. He struggled over a quarter of century farming his land and getting poor returns for his output, but he found his property had sufficiently increased in value to give him a competence which other men got by other means. There comes now the time for expenditure of large sums on any piece of property in order to draw from it profitable returns. The miner and the agriculturist, of all industrialists whose product is in commerce, are more in need of help.

"Meanwhile, here we are in a little isolated group, only getting together at irregular times and trying to cover topics in twenty minutes which should take all week to properly discuss. You must be alive to the combination that is against you. In many instances the manufacturer has the product of the mines sold to him at less than the cost of production. But he is united and well organized to influence legislation. You have only one agency to care for your needs, the American Mining Congress, and could give it your support and cooperation—its work is in competent hands. You should also support the Sacramento Chamber of Commerce, which in its way is doing largely what the American Mining Congress is doing in a broader sense.

"Your situation, in so far as expenses are concerned, is linked up with a movement to employ all the able-bodied men of the United States. Governmental costs will not be reduced. The standards of living are being raised all the time. And these standards have to be maintained. To go back to the simplicity of the days of Lincoln would throw 26,000,000 of our 42,000,000 workers out of jobs.

"You must get together and understand your problems. You must work them out. You must look them squarely in the face and be prepared to fight for what is yours. There never has been the proper cooperation in the mining industry. The best interests of the industry have been put to sleep. The consideration of your problems now takes in the whole world. It involves the flow of trade among the nations. It takes in the changing habits of life as broader uses are found for the products fashioned from the earth's resources."

Brief additional talks were also made by Lewis Carrigan, secretary of the Northern California Counties Association, who urged the mining men to take a greater interest in civic affairs and to get the civic bodies back of mining; C. E. Jarvis, who pointed out that the State of California only appropriates about $50,000 a year for the state mining bureau, about one-eighth of a mill for every dollar produced in the state by the mineral industry; Lloyd L. Root, who urged concerted action to get men elected to the state legislature who are sympathetic towards mining, and the writer, who pleaded for the mining men present to go back to their districts and organize mining departments in their civic bodies. Responses to the address of welcome were also made by Secretary Callbreath and Jarvis, the latter explaining the work of the Sacramento department.

Greatest of Conventions

At the banquet Tuesday evening, Secretary Callbreath delivered a masterly address on the mining industry, holding the closest of attention by those present for more than an hour. They would not let him stop, when he made an effort to several times. Secretary Callbreath declared unqualifiedly that the Sacramento convention of the American Mining Congress this fall would be the most successful in history and the most influential since the organization was founded 27 years ago. He said the program arranged by the Western Division for a reawakening of popular interest in mining and the spirit shown at the Grass Valley meetings warranted his optimism

Mr. Callbreath asserted that the big problem of the mining industry in the United States is to make "this country so self-sustaining in its metal production that it will be absolutely independent of foreign mineral products. Never again, if it is possible to avoid it, must the United States be dependent on Brazilian manganese for the manufacture of its war munitions. That is why we fought

so hard for the enactment of the tariff on manganese ores, in the face of bitter opposition from the steel industry, which controls vast manganese deposits in Brazil. We wanted to foster the development of our own manganese deposits, and our investigations showed that we had very large supplies in this country waiting development.

"Protection is not a partisan question in the American Mining Congress. We have Republicans and Democrats in the organization, and since I've been secretary I don't know which party I belong to. If the country wants protection, we're for protection. If it wants free trade, we're for free trade. But we believe this: if the mining industry has to pay labor in a protected market, buy materials and equipment in a protected market, and do business with other interests safeguarded by a protective tariff, then the mining industry must get its just share of the benefits of a protective tariff.

"In regard to gold production. You all know that the McFadden bill was defeated—I think it was introduced a year too late. We have a law against defacing gold coins in this country, but we have no law to prevent jewelers and other commercial users of gold from breaking up the gold coins they buy from the mint. We should work for the enactment of such a law, which would accomplish some of the objects sought by the McFadden bill. It is only justice, we think, that the government should protect its medium of exchange from destruction, from conversion into luxuries, from the means of trade, by attaching a penalty to the breaking of gold coins. These coins have been minted at the expense of the taxpayers. When a jeweler melts them for luxuries, something valuable is gone. He should be compelled to buy his gold in the open market.

"Now as to the blue-sky laws. Thirty-eight states have enacted such restrictive measures, some worse than others, and we still have with us the Denison national blue-sky law. Understand me plainly—the American Mining Congress holds no brief nor has any sympathy for the unscrupulous mining promoter who fleeces an innocent investor. We want even stricter laws to curb his activities. We know that these blue-sky laws have failed to do so, and I am aware of several such instances in your own state. But we must replace these blue-sky laws with saner laws. I am opposed to any law which places in the hands of one man or a small commission such despotic power as the right to determine the legitimacy of an enterprise as to the merits of which he is not fitted to judge, or to tell me that I cannot invest my own money how and where I please. That is going too far."

Secretary Callbreath went into detail also on the taxation question and explained the work of the Congress in behalf of the industry.

Prof. Frank H. Probert, mining engineer of many years' experience and dean of the College of Mines at the University of California, at Berkeley, was the other speaker of the evening, and delivered a most interesting address on the future methods to be pursued in mining. The keynote of his speech is in the following excerpt:

"The great mines of yesterday ought to be the great mines of tomorrow. The

George A. Stahl

waste of today will be the ore of tomorrow as our understanding of mining becomes clearer. If we look for new fields, new deposits, we must at the same time apply scientific processes and keep abreast of the latest developments. We have to substitute the mechanical unit for the human unit wherever we can, because we are living in a mechanical age of mining."

Mayor Brock, of Grass Valley, made an accomplished toastmaster, and gave some interesting reminiscences of early mining.

Summing up the two-day sessions at Grass Valley, one must say that they were epochal as far as California gold mining is concerned, if not also marking a new era in western metal mining. They aroused a spirit of optimism regarding the future of the industry, a manifestation of cooperation among mining men never before shown, and a realization that now or never the problems of the mining industry must be clearly faced and solved. Today this brighter vision for the future, this enthusiastic willingness to work together, is being realized throughout the western mining world by those in attendance, and great good must come out of it.

COAL MINE ACCIDENT STATISTICS

ACCIDENTS at coal mines during the month of April resulted in the death of 234 men, according to reports received from State mine inspectors by the Interior Department, through the Bureau of Mines. The fatality rate for the month was 6.44 per million tons of coal produced, as compared with 3.71 for April last year and a 4.94 average for April during the 10-year period 1914-23. The high fatality rate for April, 1924, was due to an explosion at Benwood, W. Va., on the 28th, which resulted in the loss of 119 lives. The rate for bituminous mines alone was 6.91 per million tons (including the Benwood disaster), as against 3.48 for April last year and a 4.67 average for April for 10 years. For anthracite mines alone the rate was 4.41 per million tons, as compared with 4.96 for April, 1923, and a 10-year average rate of 6.28. Of the 234 men killed in April, 1924, 30 were killed at the anthracite mines in Pennsylvania and 204 at bituminous mines throughout the country. Underground accidents at both classes of mines numbered 220, shaft accidents 4, and surface accidents 10.

During the first four months of 1924, Bureau of Mines records show a total of 993 lives lost, indicating a death rate of 5.06 per million tons. For the same period last year the rate was 4.08. The four-month average rate for bituminous mines alone was 5.03 in 1924 and 3.84 in 1923; for anthracite mines alone it was 5.19 in 1924 as compared with 5.36 in 1923.

"Major disasters," that is, disasters in which 5 or more lives were lost, numbered five during the period of January 1 to April 30, 1924; the resulting loss of life was 384. During the corresponding months last year there were four similar disasters, with a loss of 140 lives.

Comparing the causes of the fatal accidents in 1924 to the end of April, with those for the same period in 1923, the records for 1924 show reduced fatality rates attributed to falls of roof and coal, haulage equipment, explosives, and electricity. Increased rates are shown for explosions of gas and coal dust.

ROCK DUST SAMPLES

The Bureau of Mines is being flooded with samples of rock dust sent in by operators for examination, and requests for assistance in the installation of rock-dusting apparatus. Difficulty arises in that the Bureau's personnel and appropriations are not large enough to carry on the work as they would like to and as it should be done.

TRANSPORTATION ACT SURVIVES CONGRESSIONAL PROPOSALS

Measure Authorizing General Rate Investigation Held Over—Commission Opposes Program—Amendments To Transportation Act Await Final Action

CONGRESS adjourned without passing the bill providing for a general investigation of the railroad rate structure by the Interstate Commerce Commission. The Senate resolution which declared agriculture to be *the basic industry* of the country and directed the Commission to take action for the revision of rates on the products of agriculture, including live stock, was not acceptable to the House.

In the House debate on the Senate resolution, Representative Huddleston of Alabama, declared that "in effect, it is proposed by this resolution to take a part of the freight charge off of hay and put it on coal. It proposes to give the products of the farmer an advantage over the products of the mine."

"Railroad rates are out of joint," said Representative Huddleston, "upon all heavy commodities which are hauled for long distance and as to which the freight charge represents a substantial part of the cost. That applies to various agricultural products, and also as to coal, lumber, stone, gravel, and many other products of the mine, of the forest, and of the factory."

The House Committee on Interstate and Foreign Commerce eliminated the declaration that agriculture is the basic industry, and revised the House resolution, sponsored by Representative Hoch, of Kansas, by adding a paragraph embodying in part the declaration of policy contained in the Senate resolution that products of agriculture affected by depression should have "the lowest possible reasonable and lawful rates compatible with the maintenance of adequate transportation service."

The resolution as reported by the conferees and as it will come before the Senate next December, provides as follows:

"That it is hereby declared to be the true policy in rate making to be pursued by the Interstate Commerce Commission in adjusting freight rates, that the conditions which at any given time prevail in our several industries should be considered insofar as it is legally possible to do so, to the end that commodities may freely move.

Investigation Proposed

"That the Interstate Commerce Commission is authorized and directed to make a thorough investigation of the rate structure of common carriers subject to the Interstate Commerce Act, in order to determine to what extent and in what manner existing rates and charges may be unjust, unreasonable, unjustly discriminatory, or unduly preferential, thereby imposing undue burdens, or giving undue advantage as between the various localities and parts of the country, the various classes and kinds of commodities, and to make, in accordance with law, such changes, adjustments, and redistribution of rates and charges as may be found necessary to correct any defects so found to exist. In making any such change, adjustment, or redistribution the Commission shall give due regard, among other factors, to the general and comparative levels in market value of the various classes and kinds of commodities as indicated over a reasonable period of years of a natural and proper development of the country as a whole, and to the maintenance of an adequate system of transportation. In the progress of such investigation the Commission shall, from time to time, and as expeditiously as possible, make such decisions and orders as it may find to be necessary or appropriate upon the record then made in order to place the rates upon designated classes of traffic upon a just and reasonable basis with relation to other rates. Such investigation shall be conducted with due regard to other investigations or proceedings affecting rate adjustments which may be pending before the Commission.

"In view of the existing depression in agriculture, the Commission is hereby directed to effect with the least practicable delay such lawful changes in the rate structure of the country as will promote the freedom of movement by common carriers of the products of agriculture affected by that depression, including livestock, at the lowest possible lawful rates compatible with the maintenance of adequate transportation service: Provided, that no investigation or proceeding resulting from the adoption of this resolution shall be permitted to delay the decision of cases now pending before the Commission involving rates on products of agriculture, and that such cases shall be decided in accordance with this resolution."

Rate Reductions Since 1920

The chairman of the Interstate Commerce Commission submitted a report to the Senate Interstate Commerce Committee on rate reduction made since the general increases in August, 1920. The report estimated that from July 1, 1922, to the end of 1923 shippers and consumers of the country paid nearly $800,000,000 less in the charges for transportation of property than would have accrued if no reductions had been made below the rates established in August, 1920. Of these, it was roughly estimated that more than $175,000,000, or about 22 percent of the total, represented a decrease in freight charges on livestock and products of agriculture, which constituted approximately 15 percent of the tonnage.

It was shown in the report that the reductions, many of which were voluntary, on copper and lead from Anaconda, Montana, to Seattle, Wash., between August 26, 1920, and May 1, 1924, amounted to 10 percent; on copper from Anaconda to New York 43 percent and lead 25 percent; on lead from Utah to Chicago 42 percent, and from Utah to New York 36 percent, and on iron ore from the Mesabi Range to Duluth 10 percent. Percentages of decrease in the case of mine products between other points also were included in the report. The report contends that the general reduction of 10 percent in 1922, coupled with the individual reductions previously made had a tendency to stabilize the rate structure so far as the general level of the rates was concerned.

The Interstate Commerce Commission is opposed to the program of undertaking a general investigation of the rate structure such as that proposed in the foregoing resolution. The Commission believes that little relief is to be expected from such an investigation and that the actual work of examining the whole rate structure of the country will consume at least ten years and will be found more difficult and of less value to the country than the work of valuation of railroads which is still in progress.

The Gooding amendment to the long and short haul clause, designed to give relief to shippers and consumers in intermountain territory, the Robinson Surcharge Bill, proposed to eliminate the surcharge on Pullman fares, and the Howell-Barkley Railroad Labor Bill, will be on the Senate or House calendars when Congress convenes next December and will have early consideration along with the rate revision resolution. Many railroad bills, including the Cummins bill on consolidation of railroads were still pending in the House or Senate Committees when Congress adjourned.

The increased efficiency that obtains at the present time in the operation of the railroads has had much to do with the development of a general feeling among shippers that the solution of the railroad problem can not be found in further experi- (*Continued on page* 334)

THE DRY CLEANING PROCESS FOR COAL

Discussion At Cincinnati Meeting—Recent Developments In Equipment — Description Of Paint Creek Coal Company's Plant—Primary Vs. Secondary Preparation—Cost Of Process—Its Advantages And Disadvantages

RECENT Developments in Equipment for Preparation of Coal," proved to be one of the livest subjects on the program of practical operating problems arranged in conjunction with the National Coal Equipment Exposition at Cincinnati during the week of May 12.

Col. Warren R. Roberts was chairman of the meeting and was also responsible for the selection of speakers and the various phases of the discussion. The subject was divided into three subdivisions: (1) The new dry cleaning process, (2) primary vs. secondary preparation, (3) most modern equipment for loading each size of coal after preparation.

The New Dry Cleaning Process

Humphrey D. Smith, general superintendent of the American Coal Company, explained the operation of coal-cleaning equipment at the Paint Creek Mine and the Wyoming Coal Company mine in West Virginia. The Paint Creek mine is operating the first large commercial dry cleaning plant which has been constructed. A small plant has been in operation in a far western mine.

Mr. Smith, in part, said:

"The term 'dry cleaning' of coal, from a practical standpoint, is more of a concentrating process, using air instead of water or other form of liquid. In the present development I wish to refer to our plant at the Paint Creek mine of the American Coal Company and also the Wyoming Coal Company, West Virginia. Our plant is a slightly larger one in regard to size of the plant, capacity handled, but the same details in the way of handling the coal from the main screens into the cleaning building, the sizes of the coal, the handling of the coal from the screens into the bins, from the bins to the cleaning tables and from the cleaning tables into the railroad cars, the handling of the largest coal, the system in connection with the cleaning tables, is practically the same. At the plant of the Paint Creek Company, coal that goes down the 6-inch Marcus screen is carried up to the top of the dry cleaning building. The rate of flow we are now handling in the Paint Creek plant is approximately 185 tons of coal per hour that will go through a 2-inch ring. In the plant of the Wyoming Company we run approximately 150 tons per hour. When coal gets to the top of the cleaning building, we have in the Paint Creek plant a battery of 36 Hummer screen nets, with 36 vibrators. We divide the coal into seven sizes: 2 inches to 1½ inch; 1½ inch to 1 inch; 1 inch to ½ inch; ½ to ¼; ¼ to ⅛; ⅛ to 1/16; 1/16 to dust. From 1/16 to dust is by-passed and not treated, but the other sizes, from 2 inches down through the 1/16 is treated.

"After the coal passes over the Hummer screens we have bins of a capacity of 15 tons over each separating table. After the coal reaches the cleaning bin we have small reciprocating feeders that feed the cleaning tables at the feeding end and are so arranged to give us a constant feed on the tables. In other words, we find that the best results are obtained when we keep a constant bed of coal on the table. We use the bin merely as a medium in case the flow of coal into the plants should vary.

"Our plant has been in use approximately a year and we have actually run through this plant 192,000 tons of coal; that is, from 2-inch down to dust. In treating the coal we have found that on the larger sizes we have not been

General Outside View of the Wyoming Coal Co.'s Air Cleaning Plant at Wyco, W. Va.

able to get enough of the larger sizes to give a proper bedding to the table and on account of this the 15-ton bins come in very handy. The larger sizes operate intermittently, that is, from 2 inches to 1½ inches, and 1½ inches to 1 inch. The other tables run continuously.

Ash Reduction

"In regard to ash reduction, which I imagine is the important point that everybody would like to know about, we have taken, I imagine, hundreds of samples and chemical analyses of ash, and all other kinds of tests to keep track of all performances. The general average of all tests taken indicate that all coal coming through the cleaning plant will run about 10 to 12 percent in ash. The average ash of clean coal that is shipped in the railroad cars is running approximately between 7 and 8½ percent, although we have had some samples that run better and some worse, but the general average of all coal shipped will run about as stated. That includes the by-pass coal that was not treated on the table. The coal actually treated on the table will run from 4½ to 5 percent up to about 6½ to 7½ percent, while the crude coal on large sizes will run from 13 to 17 percent and on small sizes usually around 9 to 10 percent, so you see we are obtaining an ash reduction that will vary between 33 1/3 percent and 50 percent.

Dust Collecting System

"The cleaning process and the entire operation of the plant is really divided into three main factors. One of the largest problems has been the screening of coal, the next is table operation or cleaning, and the next is the dust collecting problem.

"When we first started out, very little was known of the collecting of dust and the amount of dust we would have to collect. We met with considerable grief as we found it would be absolutely necessary to take all the air of our plant from the table away in the dust collector system. We have three fans; one double 72-inch fan built by the Sturtevant Company, which handles the air from the first two largest size tables—from 2 to 1½ inch, and from 1½ to 1 inch—the other fan of this double fan handles from 1 inch to ¼-inch, and the third fan, a single fan, handles all sizes from ¼-inch down to 1/16. We have a total of eight tables in operation at the Paint Creek Plant while the Wyoming Coal Company, I think, have five tables, but the same general scheme throughout the plant is used in both cases.

"We feel we are handling 100,000 cubic feet of air per minute through our dust collecting system. Our air for the fans comes from large hatches into two large centrifugal dust collectors placed on the outside of the building and we are recovering all the dust except the very finest air float which would be under 200 mesh. The dust from these collectors is piped and taken over to the clean coal elevator and re-mixed with the clean coal in the same proportion in which it is taken out, which is the same process by which the by-pass coal, which is not treated, is handled.

"In regard to the power item in our plant, I do not like to give our figures as a criterion for any new plant, as the present plant was built into an old wet washer plant which we had. We merely took out the washer equipment and put in the new dry equipment in the same building, and we have some six or eight operations in there that probably would not be necessary in a new plant; but taking the connected load in the plant as approximately 525 horsepower, our power consumption per ton of coal treated would run 2.35 kw. hours per ton of coal. We expect to make some reductions in that on some drives we have and hope to bring it down to the neighborhood of 2 kw. hours per ton of coal.

Cost Of Dry Cleaning

"The cost of dry cleaning coal will vary largely. We have four men, and occasionally five, to look after the equipment, but since the beginning of the year we have averaged four and a half men in the building all the time since it has been in operation.

"The cost of depreciation in a building of this size is pretty light. With the type of building we have, being a wooden structure, we are setting up a higher charge than would be necessary in a new plant of steel construction and a plant which would be more up to date. But in round figures I should say that the cost of dry cleaning coal would be twenty cents a ton. That is, figuring the power charge and depreciation of plant. In that amount I have not figured the rejects as any factor. That will depend on the man's own proposition, whether he wants to figure his rejects as against the cost of cleaning or not.

"We sell all our coal on a commercial basis and do not use our own product. We feel we have to throw that away, but that is our loss and we are not charging that against the dry cleaning proposition.

"So much for the present development from our standpoint.

Advantage of the System

"In regard to the advantages, we feel our main advantage in dry cleaning coal is our ability to ship our customers dry coal. We have had several wet washers and are still operating one, and from our standpoint we have run into considerable trouble with shipping wet coal at all seasons of the year.

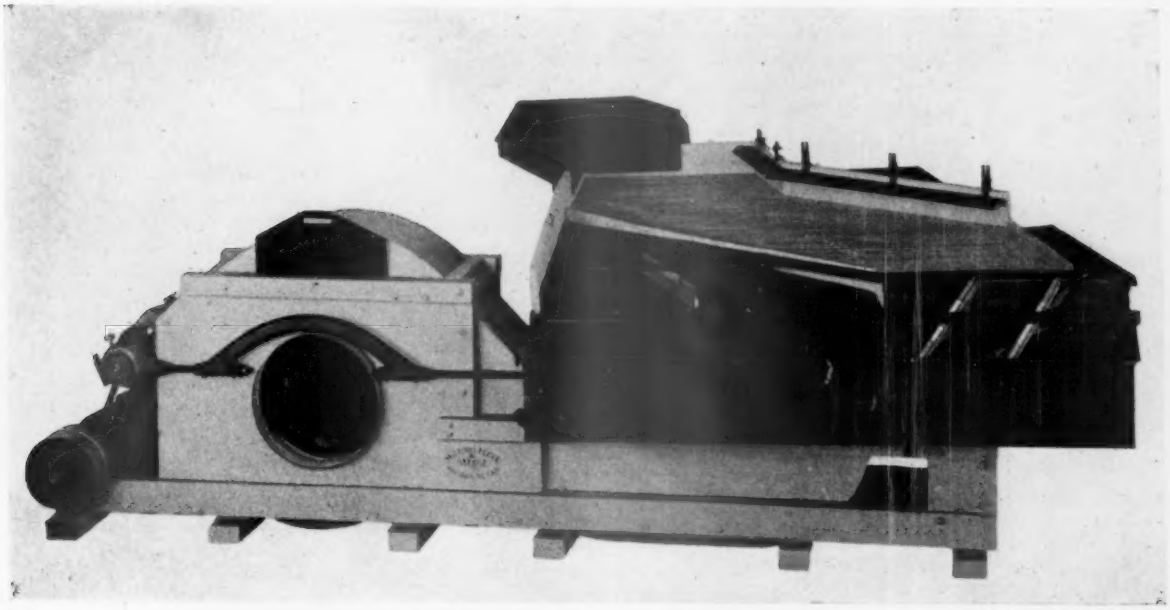
"Another advantage we find in dry cleaning is that the loss of fine coal is at a minimum.

"We find on analysis of our refuse from the table, our average ash in the refuse will run from 82 to 87 percent, which shows a very small amount of coal in the refuse, which high ash is due to the type of ash we have. In other words, the specific gravity of our refuse is nearly twice the specific gravity of our coal, and our cleaning problem is more or less easy from that standpoint. The closer the specific gravity of refuse and coal, the harder the cleaning problem and the more coal lost in the refuse.

"The next advantage we find from an operating standpoint is in the winter time. We can run our plant when it is ten below freezing as well as in the warm weather. As a matter of fact, the cold air makes the tables operate more successfully in winter time than it does in the summer time.

Type of Screens

"When we first built the plant we had anti-gravity type of screens in the building, but some few mechanical difficulties that arose with the screens made it necessary to take those out and put in the Hummer type of screens. We did not get an opportunity to get a thorough test of the anti-gravity type of screens on the smaller sizes, but since we put in the Hummer screens we are getting a screening sufficiently good to get table operation. I do not know that I could give exact figures on the efficiency of screening, but the average efficiency of that battery would be between 75 and 90 percent. It will vary with different sizes. The larger size screens are very efficient because we have such a small tonnage. The smaller sizes are very efficient. We have a very large battery of them and the screening efficiency varies with the moisture contained in your coal. We find we have practically no trouble with any of the screened sizes above the sixteenth of an inch where moisture comes from the mines. Sometimes we have a very few wet trips and we find it is impossible to screen down to one-sixteenth on the coal that will carry 4 to 8 percent moisture. In other words, your fine screens will block up, but we feel, from our results, even when that happens, it means that instead of having any by-pass coal, we are putting our entire tonnage on the table. We are using 36 units, that is, screens, 4 feet by 5 feet. Each unit is 4x5. Below 1 inch there are 32 units 4x5 and the average rate of flow of coal over those



The American Pneumaite Separator

screens, that we are running now is about 185 tons per hour.

"The smallest screen is 1/16 ton cap screen. I find that approximately 30 percent of the total coal that goes into the plant goes through the 1/16 ton cap screens. About 240 square feet for 58 tons per hour.

"The screens do not need any supervision at all if given an absolutely uniform flow with coal of the same moisture content coming all the time. About the only time they need attention is when the moisture clogs up the screen and the coal runs down over it too fast. We use one man on the screen floor and one man on the table floor and one man looking after the electrical apparatus. We have all our floors equipped with electric starters or push buttons so that we can stop and start the movement at any point. If coal on one table is moving too fast, we can stop the one behind it from coming on and stop the flow clear back to the tipple. If one table is stopped, the conveyor and everything back of that is stopped.

Air for Different Sizes

"Each table has its own blast. The air connection running to these decks is from 2½ to 6 inches, according to the size coal treated. In other words, your air coming through the table is supposed to have volume enough to lift the coal until it will rise over the levels. Larger sizes take more air. The four tables in the larger sizes take twice as much air as the other four smaller sizes. Each table is entirely separate and distinct from the other. You adjust your intake air to get to the right point of separation. After you once get that set for each separate bed, it is not necessary to touch that once a month. I believe we have not touched some of them for months after we got them properly adjusted.

Maintenance of Tables

"It is difficult to figure the maintenance of the tables in cents per ton. It would be in the tenth decimal. We have spent less than $15 on repairs since we got them. There is nothing to get out of order. We find that the intake air to the tables in your fine sizes should be clean air, the cleanest you can obtain. In other words, the small perforations will block up and you will have to take the decks off and clean them from the under side. It would be well to keep in mind the source of the intake air which you blow through the tables. We have large intake pipes running perhaps 50 feet beyond the building and 36 inches in diameter to get clean air.

Capacity of Plant

"We feel that we can run the plant up to 240 tons an hour and not work it above what it can do efficiently. In the last year we have run 192,000 tons of coal through the plant in 170 working days of eight hours. The tables do not work every unit during the whole day, because our men are like everybody else. In the morning we have an hour or two delay waiting for coal, and so forth, but in timing the actual running of the tables in the plant it runs very close to 185 tons per hour. Our feeders and elevators are arranged to take up to 240 tons an hour and also the screens and cleaning tables will handle a tonnage up to 240 tons an hour."

Sizing

Mr. Arms, of Roberts & Schaefer Co., brought out the point of sizing of the coal, stating that this is possibly the most serious objection to the dry cleaning process. In part, Mr. Arms said:

"Separation by air requires closer sizing for its perfection than does water. Air is a finer separating medium than a heavier fluid. In spite of that fact, there are so many other advantages with air, that that particular disadvantage is thoroughly overcome.

"Because it is necessary to size closer, please don't think that it is absolutely essential to have 8 or 10 sizes on each and every cleaning proposition. It has been shown here that it is possible to select one very dirty size from your coal and get a very effective cleaning and very effective reduction in ash.

"Here is a very important thought. If you take out all the refuse coal there is apt to be a shrinkage in ash which is naturally there. The operator himself must select what shrinkage he wants to effect. He must dry it out or wash it away until he strikes a happy medium.

"It has been pointed out by certain coal men that the public does not want and is not ready for an extremely low-ash coal; that if coal can actually be reduced to inherent ash, it would not make a good fuel under ordinary conditions as they now exist. Whether or not that is true, I will leave to your judgment; but it is certainly true that the uniform ash product is much more to be desired than an extremely low one. We find that the air cleaning system

produces a uniform ash, which is really an intangible asset.

"I am certain that much of the preparation into sizes is at the option of the operator and it is not inherently necessary in the dry cleaning process. If you wish to get the very last pound of ash that is in the coal, by all means get the dry cleaning process and the closest sizing and you will get the best results."

PRIMARY VS. SECONDARY PREPARATION

G. F. Osler, general manager of the Pittsburgh Terminal Coal Co., led the discussion of this phase of subject, combining it with the discussion of **modern equipment for loading each size of coal after preparation.**

Mr. Osler said: "The question of cleaning coal in Western Pennsylvania, other than by hand, has only been started within the last eight years. I do not think that there was a picking table—that is, a real picking table—and not a loading boom in connection with slate picking, down to 1914 or 1915. Most of the picking was done after the year 1917 in the Pennsylvania District.

"The sizing of coal at the present time in the Pittsburgh District includes but four sizes. There is slack, nut, stove or some call it egg and lump coal. In the Illinois District, I understand, there are seven different sizes. I have seen enough of the cleaning of coal to know that the least number of times you can handle it, the better it is for the coal, or, rather the better it is for the profits. The operator stands between the salesman and the customer. The salesman and the customer are against the operator, because the salesman will promise the customer almost anything he asks and often asks us for such a segregation of coal as we are not prepared for. When the topography of the ground is such that the primary and secondary screening and cleaning cannot be done on the same side of the track, it is necessary that the coal be put in bins until there is enough to load into the cars. In the Pittsburgh District where there is room for two tracks we take nut coal and stove coal to another bin and store it until there is enough to fill a car and then run it into the car. That is allowing you to load two cars on one track.

"In Illinois I think the number of sizes that they produce would make it nearly impossible to get enough tracks and therefore I can hardly see how they could do all the preparing of the original unit; that is, either shaking, screening or some other method of separating coal.

"In our district little attention is paid to getting into the weigh-basket. Some is loaded over shaking screens and some directly over gravity screens, which is gradually becoming antiquated even in the Pittsburgh District. Most of the operators and engineers and tipple builders do not seem to take into consideration that mine run coal will break. From the weigh-basket, or the gravity screen, where they are used, it goes directly into the cars. Where shaker screens are used, the shape of the screens have a great deal to do with the amount of slack made by the screens, and the amount of slack taken out by the screens.

"In a recent investigation I found we had nine tipples equipped with shaking screens and of the nine I can safely say that there were no two screens of the same type that would clean coal just alike. We find that wet coal will stick to nearly every type of screen.

"We found that some of the screens are so arranged that the coal is worn out in going through them, thus increasing the slack percentage.

"If the operators would take into consideration the breakage of coal after it is screened, they would not ask the engineers to do so many things with the coal without using conveyors. But the tendency is to make the first screening of coal the only operation.

"We have tried to load the same kind of coal right over the track under the tipple. It goes through two picking tables down into the loading boom to the car.

"From my own experience I think lump coal should be handled as gently as possible on your picking table, whether you use a gravity screen or a shaker screen and should be slid on a loading boom. It is absolutely essential to use a loading boom. The same process should be used throughout. Coal should be slid and not dropped. All chutes should be covered from the screening to the loading on the car, as the dust or waste of the slack is considerable. If you go around a tipple where there is no house to cover the chutes, you will see slack all around the place."

CENTRAL COMPETITIVE FIELD

Chairman Roberts stated that in the Central Competitive Field, where the sizing of coal has been given careful consideration, there is a difference of opinion among operators as to how much preparation shall be given in the tipple and in the rescreening or sizing plant, without considering the dry cleaning or washing process. "Coal that can be directly handled in the tipple should not be rehandled," he said. "Most any good screen can size No. 1 nut and egg coal in the tipple. Degradation of this coal, by taking it to the resizing plant, is so great as to be detrimental to the final product." Mr. Roberts suggested the loading of more sizes directly from the tipple with great care using loading booms, as the degradation of coal is a serious matter.

J. D. Carroll, chief engineer of the Chicago, Wilmington & Franklin Coal Company, referred to their plant, which can produce 12,000 to 15,000 tons per day. It has two 3-foot picking tables for each size of coal, which are loaded on three loading booms.

In a general discussion it was brought out that in West Virginia the hardness of coal is such that the percentage of loss by breakage is only 20 percent, as against 45 percent in Illinois.

TIPPLE PREPARATION

Frank E. Young, of New Mexico, advocated taking out as many sizes as possible at the tipple before running the coal through the rescreening plant, which he said would save breakage and loss. In New Mexico the companies take out everything down to three-fourths of an inch and make five sizes at the tipple. If it was possible to sell a smaller size, it too would be taken out in a different way. The companies use a curved chute, which is placed into cars crosswise.

Chairman Roberts said that innumerable sizes are a drawback to every operator and favored limiting the number of sizes. He stated that plants have been often redesigned to produce sizes ordered by salesmen. "I think it would be well for operators to get down to fewer standard sizes," he said.

Others participating in the discussion were **Mr. Visack**, general manager of the West Canadian Collieries; **M. B. Morrow**, of the Canmore Coal Co. of Alberta, Canada; **T. M. Chance**, of Philadelphia; **Thomas Frazier**, of the University of Illinois, and **E. W. Park**, of the Interstate Coal Operators' Association.

COAL CLEANING STUDIES

SPECIFIC problems in coal beneficiation which come to the attention of the Department of the Interior and which are considered to be of general interest, rather than an individual operator's special problem, are investigated by the Central District experiment station of the Bureau of Mines, Urbana, Illinois, in order to further the better preparation and more conservative use of fuel. In these investigations samples of the coal in question are examined in order to determine the nature of the impurities and the improvement that may be expected in treating the coal by a cleaning process. Tests are being made with the pneumatic table on a number of Eastern and Central District coals to ascertain the effectiveness of this method of treatment and its suitability for different types of coals. A general study of the dry cleaning process is being made in an effort to apply such methods in coal preparation work and to develop a simple method of treatment.

GREATER SAFETY IN MINING DISCUSSED

House Committee Holds Hearings—Director Bain Suggests Plans—Education And Field Demonstrations—Cooperation With Mining Industry

SUGGESTIONS to increase safety in mining were advanced by Director H. Foster Bain of the Bureau of Mines in testimony before the House Committee on Mines and Mining. Director Bain recommended that the bureau be authorized to promote safety through exhibitions and field demonstrations in cooperation with the mining industry and the various states, and that additional mine rescue cars and stations be provided. In discussing the matter he said:

"The first function of the Federal Government as regards safety in mining is to make the investigations and conduct the research necessary to furnish the technical data upon which the states may rely in formulating and enforcing sound safety regulations.

"The second function is to assist the states and the industry by ascertainment of the facts and dissemination of these facts with a view to educating all concerned to the highest practicable standard of safety in the great basic industry of mining.

Safety Results Reviewed

"The investigation of the causes of mine accidents and of the means of accident prevention by the Federal Government has been underway for fifteen years and many strikingly useful results have been obtained. The system of testing for permissibility of explosives and apparatus for use in gaseous and dusty mines in particular has shown direct benefits. The introduction of permissible powders in place of the more dangerous older types has resulted in large savings of life and the application of the same system to electrical and mechanical devices has already gone far enough to prove that a similar and much needed improvement is possible. The limitations on rapid introduction of permissible apparatus lie largely in the smallness of the testing staff and plant of the Bureau of Mines and the virtual absense of any qualified force for making field demonstrations and exhibits in order to bring about rapidly the common use of such equipment. With the mechanicalization of the American mines which economic conditions is bringing with a rush, the danger due to the use of non-permissible machines is certain to increase enormously unless a change can be made now. This is work for which the states have no facilities, where a multitude of conflicting standards in any event would serve to increase the danger, and where the responsibility rests directly on the Federal Government.

"As regards explosives, the principal gap in the present service is due to the fact that explosives are only taken into account after they reach the mine. Their manufacture, transportation, handling and storage are not only not regulated by the Government but the latter does not even offer the service of technical advice to the various states and municipal regulating bodies or to industry. From time to time serious accidents occur even in the heart of our great cities and there are known to be numerous instances of most unsafe storage of explosives where life and property are at hazard, with no definite source of authoritative information available to the town councils and other bodies responsible, or to public officers charged with prosecution of criminals or suspected criminals. The Bureau of Mines is frequently called upon to advise regarding such situations and definite provision should be made for meeting this need. The cost of such provision will be small as compared with that of any one of several post-war explosions.

Rock Dusting

"Despite the large amount of research already accomplished, often at considerable expense, the industry has been slow to adopt some of the most important better practices developed, such as rock-dusting, to limit coal dust explosions. The largest number of deaths and injuries in mine accidents arise from causes mainly within the control of the individual worker. It is necessary, therefore, in order to reduce accidents, to educate the whole industry to the danger of present practices. The facilities and staff available to the Bureau of Mines for such extensive and intensive educational campaigns are inadequate. Despite the good work done by the mine safety cars and stations and the training of over 100,000 workers by their personnel, the shifting of workmen, the natural inertia, and the inherent complexities of the situation have made it impossible to do more than keep the accident rate from becoming markedly worse despite the deepening of the mines and steadily increasing danger.

"To make any real and considerable decrease in mine accidents it must be recognized that field exhibits, demonstrations, and instruction are as essential as the research upon which safety recommendations are based. In order to accomplish this work it will be necessary not only to have staff and equipment but great freedom to cooperate with the states, associations, companies and groups of miners to the end that every agency be brought to work together. Legislation similar to that under which various bureaus of the Department of Agriculture carry even to the individual farm when necessary, the message and the methods designed to increase crop production, is called for. If our mines are to be made safe the scientific and technical data available to the Federal Government must be brought home in understandable form to the one who alone can make it effective.

Mine Inspection

"The suggestion has been made that the Federal Government should, if practicable, find a way to take over and standardize mine inspection as conducted by the states. There are grave, it not insuperable, constitutional objections to any such legislation. Aside from that it seems inadvisable and unnecessary. The responsibility now belongs to the states and while there is a deplorable lack of uniformity and the state inspectors are in some instances most inadequately paid and supported, the Federal Government has enough to do in its own field. If the provision already suggested permitting cooperation be made, it will be possible on the request of any state feeling such need, for the Bureau of Mines to arrange to supply a limited number of technical specialists to serve with and supplement the regular work of the state inspectors by taking samples, making tests and analyses and performing similar duties. Such cooperation would be mutually helpful to the state and federal forces but provision for it should be permissive only.

"One of the considerable difficulties in the way of decreasing accidents in mines lies in the variation in standards of safety among the various states. At the same time the broad and keen competition in the bituminous coal industry especially, makes it virtually impossible for one state to enforce a higher and more expensive standard of safety than is enforced in others where the mines compete for the same market. This is a real and a serious problem. It is not one that can be met by federal legislation but must yield rather to conference and progressive diminution of differences. A state had better temporarily lose trade than permanently lose lives, and fortunately when faced by the facts the states have not hesitated to act. Following the Cherry disaster the State of Illinois realized the fact that danger from fire in its mines was much greater

than had previously been believed, and a drastic fire code was enacted. Similarly, following the great Castle Gate disaster of this year, the State of Utah has put into effect the best set of mining regulations from a safety point of view yet adopted by any state. Miners, operators and state officials all quickly reached agreement as to the necessity for and the content of the new regulations because they had a lesson in the danger of the older practice. The difficulty is to make men see these dangers and the need and practicability of newer methods before sacrificing a large number of lives in driving the lesson home. A conference of governors ought to be helpful in getting the best methods of accident prevention now known more widely adopted.

Utah Law Best

"In the case of Utah, it was easy to effect a change when the necessity became apparent, since the terms of the mining law are broad and actual regulation is by safety orders promulgated by a continuing authority. The same system obtains in California and was adopted by Congress to cover mines on public lands where the Secretary of Interior has authority to issue regulations falling within the terms of the basic law. This is believed to be a better system than that of minute specification in a code or statute law. The latter is too inflexible and slow-changing to meet the march of technical improvement and the vagaries of competition. None of the states relying on statute law have now a satisfactory code covering the use of electricity underground because that use had developed too rapidly. At present the Bureau of Mines is not even able, being behind in its research and tests, to give entirely satisfactory information on which to frame such a code. Its best advice has been summarized in the operating regulations for mines on government land, and these can and will be changed as the need becomes apparent. It is believed that this plan of prior agreement as to the general principles and standards of safety with a flexible system of regulations and orders as need arises is better than an attempt to write a model law and secure its enactment by all the states.

Publicity Favored

"While the bureau has authority to publish reports and in particular miner's circulars, and has specific authority to disseminate information concerning these subjects in such manner as will best carry out the purposes of the act creating the bureau, it has been ruled that under existing law no annual other than the annual report can be printed. A brief, cheap annual intended especially for the miners as a reminder of the dangers of his work and pointing out methods of accident prevention, a publication that has proved widely popular and was believed to be accomplishing definite good, was accordingly suspended. It is believed that specific authority to print some such annual of limited extent might wisely be given.

"One of the features of the work of the bureau that has attracted wide attention and has proved of real value has been the maintenance of a mine safety service, operating mine safety cars and stations. The cars are equipped for rescue work and training and most of the stations, which are in the centers of mining, are served by auto-trucks. It is not the intention that this service should assume responsibility for protecting and recovering mines and miners after disasters, in the sense that a city fire department operates, since such an undertaking would run to expense much beyond that properly to be incurred by the national government. The service is more for the purpose of developing apparatus, methods and tactics and for training men. It is the hope and expectation that in time there will be at each mine at least one trained crew with sufficient apparatus for its use. In time of need the crews from neighboring mines assemble and a trained force is quickly at hand. Notable progress has been made on this program and already many companies, individually or in cooperation, maintain mine rescue stations. Several of the states have provided state crews, instructors and equipment and in many parts of the country it is now possible within a few hours to assemble fifty or more trained and equipped rescue workers.

"The Bureau of Mines' staff and cars respond to all disaster calls and give such assistance as is possible, the large amount of equipment and of supplies carried on the cars and the experienced staff often proving of the greatest aid at critical moments. Since the state inspectors have full legal authority over the mines the Bureau of Mines men at disasters serve as volunteers under them, as miners are not men who argue jurisdiction in the face of need for help.

"At present the bureau has in service ten mine safety cars. These are devoted in the main to training men in first-aid and mine-rescue methods, and also respond to disaster calls. Two of these are old wooden cars, far from safe for the high speeds incident to running to a mine fire or explosion. A steel car to replace one of these is authorized in the pending appropriation bill. Seven of the cars are of modern steel construction, three are old wooden cars worn out in service, and four were purchased under the Foster Act of March 3, 1915. One car is of semi-steel construction transferred from the Public Health Service and good for several years service. In addition, arrangements have been made for fitting up a caboose for service on the Government railroad in Alaska.

"At Pittsburgh there is an old wooden laboratory car which, in the absence of anything better, has three times in a little over a year, been hastily equipped and run at high speed across the mountains to disasters where the crew rendered valuable service in mine recovery work. For safety to the men the whole of the fleet of cars used to respond to disasters should be modern steel equipment, though the semi-steel car now in service might well be held at Pittsburgh for reserve and emergency use.

Rescue Service

"As now arranged the districts served by the cars are dangerously large and the number of mines to be served is so great that in the case of one of the cars it would only be possible to get around once in five years to train or retrain men. This is too long an interval since methods and men change rapidly. By making a new division of districts it would be possible to use to advantage two instruction cars where disaster calls would be so improbable and infrequent that a cheaper, less expensive car could be employed. This would lighten the duties of the present fleet so that greater protection and more rapid training could be given to the fields where the greater danger lies.

"When the new cars were first put in service there was included in each crew a surgeon and an engineer. With readjustment of the work these men have each been given stations in their corresponding car districts where they may serve both the cars and the fixed safety stations. They are also engaged in making accident prevention surveys and studies with a view to marking out danger points and dangerous practices in advance of accidents, though both surgeons and engineers are available on disaster calls. It would be possible to speed up the training work and make more progress in teaching safety if a third instructor were added to the two already on the car, since a greater range of subjects could be taught and more attention focused upon the need and methods of safety. It is proposed to submit estimates to carry out this program.

"In general, if the Bureau of Mines, as one branch of the Federal Government devoted to the increase of safety and efficiency, is to do better or more work it will be necessary that it have a larger staff and more funds, and in preparing estimates for the coming year it is proposed to lay these needs before the Budget Bureau and Congress. Meanwhile, aside (*Continued on page* 334)

AMADOR COUNTY—HOME OF BIG GOLD MINES

One Interesting Trip Planned By California For Delegates To Twenty-Seventh Annual Convention The American Mining Congress—Startling Contrast Shown Between Present Day Production And Days of '49—Big Mines To Be Inspected

By Harold Tallon*

AMADOR COUNTY, "The Heart of the Mother Lode," holds in store a delightful trip, for those of the American Mining Congress who avail themselves of the opportunity to enjoy a jaunt through this historic, gold mining community during the days of the Convention at Sacramento, September 29-October 4th.

Contrasts in endless variety will feature this trip through historic Amador. Modern mining methods carried on by the big operators along Amador's Mother Lode, at such famous properties as the Kennedy at Jackson, (the deepest gold mine on the American Continent) or at the Plymouth Consolidated Mines, Ltd. (with the most modern milling plant in California), surely will furnish contrasts when placed in comparison with the methods used by the lone prospector or the old forty-niner, who yet inhabits the hills and canyons of Amador, and like in the days of old, still secures enough dust and colors to whet the appetite for more and thus is spurred on to continue the search for "pay ore" that is certainly only but a few feet further down.

Gold Found in March, 1848

The gold production in this country is consistent. The first discovery was made here in March, 1848, and since that time gold mining has been the chief occupation in this community. Great things, mighty works, magnificent clean-ups, are today in progress but a stone's throw from quaint, deserted, picturesque gold camps whose glory lies in their past and whose future is measured only by patient souls, resolute prospectors still full of faith, and mayhap by determined mining men who believe in them as places worthy of placing new effort.

A trip through Amador County should be one of unceasing interest. The motor trip now being arranged through this section by the Department of Mines and Mining of the Sacramento Chamber of Commerce for the benefit of the delegates to the Convention is scheduled to take the visitor first to Plymouth, where is located the famed Plymouth Consolidated Gold Mines, Ltd., one of the properties of which William J. Loring is head. This property will be inspected by the delegation.

In the section from Plymouth to Sutter Creek, a distance of eight miles, there is little mining activity at the present time. Two mining towns, Amador City and Drytown, lie between Sutter Creek and Flymouth and have hopes that development will be undertaken in the large properties adjacent which have been closed down for some years.

Contrasting Methods of Placer Mining

Above—Sam Loy, familiar figure since '49. Below—The Elephant Deep Hydraulic Mine, Volcano, Amador County

Drytown Breathes Pioneer Atmosphere

Drytown is the more historic of the two camps. It dates back to the "Day's of '49" and a delightful romantic atmosphere hovers about the camp. Stone buildings, iron doors, heavy shutters, such picturesque harkings of historic mining times as these attach themselves to the various edifices of Drytown. Yet to a citizen of the Mother Lode these are not unusual, for they characterize in themselves all that is unusual and typical of a California mining town of historic times. A short distance from Drytown is the site of the almost forgotten gold camp of Rancheria. Here in 1854 trouble arose between two factions —the American miners arrayed against the Spanish and Mexican miners—whose actions had not been creditable. Late one evening the Spanish-Mexican outlaws raided the town of Rancheria, killed a number of men, women and children and then fled southward along the Lode. Feeling ran high, the Americans were inflamed, and they gave hot pursuit to the bandits. They were tracked as far as Sonora, Tuolumne County, where most of them were captured and strung to the most convenient tree.

At Drytown the Virginia Consolidated Mining Company of Nevada is doing exploration work in several of the abandoned shafts. Amador City is the location of the Bunker Hill, Treasure, Keystone, Fremont, South Spring Hill, Spring Hill and numerous other famous producers which operated prior to the World War.

At Sutter Creek the Central Eureka Mine is being profitably operated by a California company. Sutter Creek has been most prominently identified with the mining industry since the very earliest days. Captain Sutter, the founder of the City of Sacramento, camped here in 1848 while inspecting his vast domain. The creek by which the party pitched their outfit was afterwards named Sutter Creek, and from this fact the town took its name also. Amador City and Sutter Creek always were connected with deep mining—quartz mining as it is known—rather than the placer mining that flourished in California in pioneer times.

This fact is also true of Jackson, which place continues to be one of the greatest gold camps in the world. Jackson's mines have a consistent history of production. The Kennedy, The Argonaut and The Moore mines are at this time telling the mining world that there is gold at great depth, that ledges persist with depth, and that gold mining is just in its infancy along this glorious Mother Lode.

Center Of Structural Industry

Twelve miles off the Mother Lode, and thirty-eight miles from Sacramento will be found the town of Ione, which is the center of much clay and sand mining activity. The (*Continued on page* 334)

* Secretary, Amador County Chamber of Commerce, Jackson, Calif.

COAL ASSOCIATION GROWING PAINS

The Organizations Are Ahead Of The Membership But The Members Believe They Have Outgrown The Associations—An Outgrowth Of Vivid Experiences

By George H. Cushing

THERE are three associations whose work is for the coal industry exclusively which aspire to nation-wide scope. They are what I call "industry associations" because they attempt to comprehend in their functional activities the whole of that phase of the industry. In all three of them the membership has been falling away or showing a disposition toward uneasiness and dissatisfaction with matters as they stand.

In that first paragraph the word "functional" distinguishes these organizations from the American Mining Congress which is not considered in this discussion. It does not serve the industry in a functional sense but in that comprehensive way which includes coal as one of the natural resources and treats it as a whole.

Prior to the various conventions there was talk, in all three of the functions, of forming competing organizations. That is, among the operators there was talk of dividing into two associations drawn up along lines of labor policy—union and non-union. Among the merchants there was discussion of a division of association work along geographical lines—east and west. But, happily, at the conclusion of all three conventions these dissentions had disappeared and it was recognized that it is futile to talk of trying to support two organizations when only one is found to be a burden.

Men of experience do not take seriously such noisy outbursts of discontent. Every industry association must pass through such times. Indeed they are encouraging. The significance of their critical utterances is that the coal men are growing; their organizations are suffering from growing pains.

The discontent can hardly be attributed as some believe, to the present financial condition of the industry. It is true that its distress is acute, for the moment. It is even possible that it is more grave than ever it has been. However, the bituminous coal industry is no stranger to financial hard sledding. It has lived through a generation during which, as a whole, it has never sold all of its coal for as much money, gross, as was paid out of pocket to produce it. That being true, the industry is not disturbed by lack of profits and is not likely to allow its familiar poverty to dictate a destructive attitude toward its associations.

To understand, really, the present status of the coal associations a word about their history will prove enlightening.

It was about seventeen years ago that I began to plead with the coal industry to organize some sort of a nationwide association. At that time a number of others had been moving, periodically, in the same direction for at least eight years. However, all of that effort had been practically wasted; nothing came of it for years. Here and there, local associations had been formed to deal collectively with labor. And, a few of these local groups had, by forming a loose affiliation with the American Mining Congress, given some evidence of a leaning toward national expression. That is they had contributed money to its support and they had attended its conventions but that was about as far as it went. There had been no real participation by coal men in any national events; there was no national spirit and certainly no consideration of any questions effecting the bituminous industry from a national point of view.

The precise situation at that time (from 1900 to 1917) was that the bituminous coal industry was local—sectional; provincial. At that time all of the men in that branch of the industry were most highly individualistic. And these individualistic men, while studying their problems from a provincial point of view, simply could not be persuaded to engage in any movement on any such scale as demanded a national point of view. They could not conceive of a national point of view. It was literally impossible to lift their thoughts to the national plane. So when as an act of politeness the operators formed their first nationwide organization, it never lived beyond the first meeting.

It required the World War with all of our major industrial activities organized only on a national basis, to lift the bituminous industry out of its thoroughgoing provincialism. Indeed, it was the organization of the United States Fuel Administration—empowered to fix the price of coal "whenever and wherever sold"—which really forced the final organization of the National Coal Association.

From that time forth the development was rapid. Individual operators, taught to study prices on a national basis and to keep books according to a national income tax law, learned to think in larger terms. Also, they soon found it necessary to fight unjust regulatory legislation proposed by the national Congress and designed to consider coal on a national basis. Thus, through their associations, and in connection with prices, wages and regulation, the bituminous operators and merchants came into the most violent contact with the national point of view and hence became familiar with that to which, theretofore, they had been strangers. When, a year ago, they found themselves in a struggle with a coal commission, which was assuming to study their business on a national basis, they were in position to take a much broader point of view upon their own affairs than would have been possible five years before.

All told, the experience of these coal men seems to have been closely similar to the oft-told method by which the Indians used to teach their children to swim—by throwing them in the water. The war—and the unwillingness of our public men to abandon war methods—wrested the bituminous coal operators from their individualistic provincialism and tossed them into the whirlpool of that intense nationalism which accompanies a great war. It was a violent revolution—so violent that it stunned alike the operators and those untrained men who had, temporarily and on a national basis, to administer the affairs of the coal industry.

Keeping that scrap of coal history in mind, it becomes apparent that any present uneasiness among these coal men springs solely from their effort to find themselves. For a generation they had been individualistic provincials. For four years they had lived under real nationalization. Now they are trying to find a new and proper relationship. They do not want and will not have—and should not have—that intensive nationalization which accompanies war. The very idea of reverting to the old sectionalism and individualism is repugnant to them; they have grown far beyond that point. The real effort of the moment is to find a middle ground—something in between. And, while their search is in progress, these men are irritable and even inclined to be a trifle destructive. Thus the whole truth about the industry associations in the coal industry is that they are suffering from growing pains.

I believe that broadly speaking, this is true: The members of the various associations believe they have outgrown their present organizations whereas the truth seems to be that the associations

have until recently been too far ahead of their members.

That is, prior to the World War, only the anthracite operators in the whole industry had what might properly be called a national point of view on coal. They had acquired it in part because their coal enjoyed such a wide market and in part by the fact that they had been engaged for years in an intense political battle with our national officials. The nearest approach to a national point of view among the bituminous men was that of the smokeless operators. They had enjoyed almost a national market for some years and were beginning to engage more and more in international trade. The producers of gas coal were in a way to get a larger view because they also enjoyed a national market and were beginning to engage in international trade. Aside from these three relatively small groups the men of the coal industry were, by the very limitations upon their business, confined to the narrowest kind of trade limits. Seldom, if ever, did their coal get more than 250 miles from home. And they were engrossed by the confining details of production and sale. Thus the industry was made up of men who were whirling around in a small zone with a radius of 250 miles. They lived in that confinement; they thought in its terms. In such association activities as they permitted themselves, they were concerned with the problems of their own state or district. They saw their labor problems in terms of competition with their next door neighbor rather than in terms of a national or international labor "situation." All of their other questions were studied on the same basis.

Their first rude awakening from this narrow little life came when they were forced to do business with Dr. Garfield who had spent a lifetime dreaming of a democracy which could function nationally with the precision of an autocracy and who asked them to begin to think with him of natural resources in terms of internationalism and as a primary cause of wars.

The shock of this astounding contact had not lost its effect before these same provincial gentlemen found themselves in contact with men who were supposed, by their own communities, to be big enough to deal with national questions as members of the national Congress. For five years these erstwhile provincials were engaged in hand to hand conflict with the leaders of national political thought. The struggle was often grotesque because the national politicians asked questions which grandly ignored even state lines only to get answers which narrowed the discussion down to the rooms and entries of the mines owned by the naive witnesses. These brushes were amusing but just the same they had their effect. The operators returned home provincials no more; a few, even, had grown beyond the confines of any association. And, it is entirely possible that here and there a member of Congress had learned that it is possible to think too big about little things.

While all of these personal evolutions were in progress the associations were necessarily passing through rather trying times. They had to match their actions to the status of their members and it was not easy to measure individual growth. Perhaps the position of the retail association was the most trying even though it is too exaggerated to be considered as truly typical. The membership of the retail association is necessarily made up of men who do a moderate sized business in a small community. Few incidents ever take these men beyond the confines of a single city or lift their thoughts above the level of a community. The officers of their national association, however, were dealing always with national officials who considered their business solely on a national basis. With the membership thinking in terms of a city or parts of a city and with the officers having to negotiate on the basis of distributing coal to the whole people, it may be imagined that there was a tremendous gulf between the two. To an extent, the same was true of the other functional organizations.

The upshot of the matter was that these officers were forever forced to translate the national point of view down to the city point of view and vice versa; they had to lead their members up and the public officials down to a common point of view. They had to compromise on every situation, the compromise being forced by what their members would permit them to do and to say.

Because no coal problem was ever truly understood by the whole membership of any association, I have yet to see a single decision which was exactly responsive to the real situation. At the same time, I know that the national officers of all associations appreciate that fact. It was that situation which induced me to say previously that the associations were constantly ahead of their members when the members really believed that they were lagging behind.

The present unrest among the association members indicates only that they are beginning to catch up with and are ready to go ahead of their organizations. It now seems entirely possible therefore, to begin to do some sound thinking about fundamental questions and to reach decisions which will be of enduring benefit. It would be possible to illustrate what I mean in many ways but the best example seems to be offered by the various rate cases now pending before the Commerce Commission.

One of these cases started off with the old and familiar contention that one group ought to be given rates under which, automatically, it could sell all of its coal without much difficulty. This carried with it the corollary proposition that the others could get into the market only after the first group had satisfied itself. The point of view on which this case was brought was a recurrence of that which was common prior to August 10, 1917; it breathed the essence of the old but not forgotten provincialism. Before this particular case had proceeded many days, there was brought into bearing many of the nationalistic theories held by Washington's bureaucracy and which breathe a persistence of the war thought.

As these two forces play upon each other the provincial idea is broadened and the bureaucratic idea is narrowed down to an approach to a sound point of view. In the harmonizing process we are beginning to get a discussion of such pertinent questions as these:

"What is the proper basis upon which coal rates ought to be made? Should we consider only the welfare of the railroads? Should we consider only the desire of the producer to sell? Should we consider only the whims of the buyer? Or should we broaden our thought to contemplate a rate structure on which twenty-six coal producing states may distribute coal to forty-eight coal consuming states so efficiently as to get the coal to the user cheaper than he can get his power in any other form?"

It is truly indicative of their mental progress to say that members and association officers alike are taking the bigger view of the rate controversy. It is especially significant that both now—and for the first time—realize that such questions establish precedents which must govern trade tendencies for a generation. Guided by that larger understanding of such questions coal men are now in deadly earnest to arrive at the right solution of the question. Only a few years ago they would have allowed such a hearing to have passed almost unnoticed.

Of hardly less importance has been the recent discussion of trade information. The effort of the trade association to gather statistics is almost as old as the trade association movement itself. It is, of course, true that years ago this information was desired by the provincial associations for the sole purpose of engaging in an adventure to beat the anti-trust laws. The provincial lawyers who, occasionally, get into our Department of Justice and who continue to swarm our outlying federal offices, still believe that business people are governed by that old desire only. But, the tone of the association discussions of such subjects today is vastly different from what it once was. Coal men are, actu-

ally, differentiating between the conduct of individuals under law and the principles of law which govern that kind of conduct. They have been educated up to the point where they know the vast legal difference between having information and misusing it.

The whole present attitude of coal associations is indicated by a recent discussion in which it was said:

"If a newspaper may gather and sell certain information; if a bureau of the Government may gather and distribute that same information; and if a coal man may get it from either source and use it in his business, it is apparent that that information is not contraband and the use of it is not illegal. That being true and the information being obtainable from two sources, there is nothing illegal in the action of a trade association if it establishes itself as a third source of the same information." And, it is highly significant that coal associations, with the full support of their members, are now fighting for recognition by the Government of that broad and fundamental principle.

Coming quickly to the conclusion of the whole matter: The temporary unrest of coal association membership may be real but is unimportant, because it is indicative of nothing more than that the members of these organizations are suffering from growing pains. Such things are to be expected in young and new associations. After a brief experience with prevailing uncertainties, these associations will be graduated to a higher plane of action—such as that occupied by the older and more mature organizations which long ago, passed through and have almost forgotten those annoyances of association childhood.

OHIO COAL MARKETS

Underwood Declares Freight Rates Are Turning Ohio Trade To Kentucky And West Virginia Mines

DESTRUCTION of Ohio's coal market was laid at the door of the Interstate Commerce Commission through its failure to remove freight rate discriminations by Representative Underwood, Democrat, of Ohio. He charged that the Ohio coal industry is losing its markets to Kentucky and West Virginia fields because more favorable freight rates were given those districts.

He said economic conditions growing out of the war are the cause of many bituminous districts being idle or operating part time and described the existing coal situation as "desperate and deplorable." He said the fact that there are too many mines and too many miners is not the only condition affecting the industry. He blamed existing disturbed conditions in the mining industry on high and prohibitive freight rates, particularly affecting certain bituminous districts. "The present coal freight rate structure should have the immediate favorable attention of the Interstate Commerce Commission and Congress," he said. "There is no necessity for continuing war rates into the period when war coal prices have disappeared. High coal prices are in large part due to high freight rates. Under existing economic conditions unfair and unjust freight rate differentials determine and affect sales in limited or dead markets. For more than half a century freight rates on coal have been built up into the present complicated structure. In establishing freight rates on long hauls from newly developed coal fields no regard was given to cost of transportation service rendered or difference in distance. The Interstate Commerce Commission, in violation of the plain intent of the laws of Congress, has repeatedly by its rulings assisted railroads in hauling freight from a favored community for less than the actual cost of the haul, perpetuating a system which has resulted in unjust freight rates and special privileges to certain coal producing districts over others. This has resulted in the ruin of many older coal producing fields. Rates made to favor the long haul in the coal traffic are not in the public interest. The existing coal freight rate basis has been built up on the theory that competition was desirable and that expansion of coal production was needed. To accomplish this the rate structure has been shaped to encourage development of fields remote from the market. To sustain the long haul a consumer from a short haul mine is compelled to pay a rate abnormally high for the part of the service rendered long haul shippers. Development has been overdone. The rate-making theory and practice should be modified so as to stop encouraging unnatural long haul development and operation. Much bituminous is transported undue distances, traveling over fields producing coal of similar grade and quality. This has resulted in encroachment on natural markets of older coal fields and enabled remote coal fields to enter large consuming markets and compete with nearer coal fields, which latter must pay a higher freight rate, at a price that does not reflect distance in the cost of transportation. This practice of unfair freight rates has permitted coal producing districts of West Virginia, eastern Kentucky and other states to ship coal into and through Ohio over long hauls at a favored rate much lower in comparison with existing rates over shorter hauls from coal fields of Ohio which are near the markets and industrial centers. This has resulted in placing Ohio coal at a disadvantage with evil effects on operators and miners. While each producing field is seeking to widen its market, each field should have a fair chance to compete for trade. The commission either evaded or failed to carry out the intent and purpose of Congress in fixing coal freight rates over long and short hauls. The favored long haul freight rate is one factor partially responsible for existing conditions of unemployment and idleness among bituminous miners and operators in many older fields.

"Congress and the commission can do much by laws and rules to stabilize and cure the mining industry of these conditions, and an expression from Congress would bring action by the commission or help in solving the problem. Existing coal freight rates in certain sections are unfair, preferential and discriminatory." He charged that existing coal freight rates are literally "killing" the coal industry in Ohio. He said the outlook in the central Ohio coal field is worse than since 1896. "Authorities recognize that reorganization of the entire coal rate structure is necessary," he continued. "Ohio operators and miners welcome action by Congress that would effect a revision of the coal freight rate structure." Referring to the fact that the railroads have assisted in increasing their markets by opening new coal fields, Mr. Underwood said the railroads own millions of acres of coal and have an interest in development of newer coal fields. While Ohio coal mining has remained stationary for twenty years, Mr. Underwood said the industry has grown rapidly in West Virginia, eastern Kentucky and other sections. He charged that freight rates favored West Virginia and Kentucky coal fields and that rates from Ohio mines are higher than for similar distances from other producing districts. "Ohio operators and miners face a dismal and unhappy future," said Mr. Underwood. "Relief must be given or mining in this state will be destroyed. Operators and miners are in a critical and desperate condition."

The Alabama Mining Institute, through its Secretary, has recently urged its members to adopt the rock-dusting method of treating mines. In their bulletin of June 5 they review the points brought out in the rock-dusting discussion at the Cincinnati meeting of the American Mining Congress.

IMPORTANT BILLS REVIEWED IN THIS ISSUE

MINING—
- **S. 2797: War Mineral Payments.**
- **H. R. 5722: Helium Production.**
- **H. R. 9029: Sinnott (R.), Ore. Potash Mining.**
- **H. R. 9019: Sutherland (R.), Alaska. Mineral Lands.**
- **S. J. Res. 121: Dial (D.), S. C. Raw Material Exports.**
- **H. J. Res. 255: Rogers (R.), Mass. Mint Coinage.**

COAL—
- **H. R. 9195: Taber (R.), N. Y. Quality Standard.**

LABOR—
- **H. R. 7698: Strike Breakers.**
- **H. J. Res. 184: Child Labor Amendment.**

TRANSPORTATION—
- **H. J. Res. 141: Rate Revision.**
- **S. J. Res. 107: Rate Principle.**
- **H. R. 9244: Berger (Soc.), Wis. Government Ownership.**

INDUSTRIAL—
- **H. R. 9199: Wilson (D.), La. Stream Pollution.**
- **H. R. 7995: Immigration Restriction.**
- **H. R. 8984: Huddleston (D.), Ala. Commodity Standards.**
- **H. R. 7959: Soldier Bonus. (Enacted into Law.)**

TAXATION—
- **H. R. 6715: Revenue Revision.**
- **S. 3273: Shortridge (R.), Calif. Tax Assessments.**

LEGISLATIVE REVIEW

Congress In Recess—Pending Legislation In Suspense Until December—War Minerals Relief—Silver Purchase Bill Goes Over

AFTER a session of six months, during which nearly 400 laws were enacted out of more than 20,000 bills introduced, the first session of the Sixty-eighth Congress closed on June 7, and unless foreign or domestic questions require an extra session the national legislators will not meet again until December 1, for the second and concluding session of the Congress. This is the first time in several years that not more than two sessions of a Congress have been held. In the Sixty-seventh Congress there were four sessions; and in the Sixty-sixth and Sixty-fifth Congresses there were three sessions each. The last two-session Congress was the Sixty-fourth. All pending measures, either in committee or on the congressional calendars, will retain their status and be subject to consideration until March 4, 1925, when the Congress closes by constitutional limitation.

The average person frequently says Congress does nothing but talk, but this is not borne out by the records, which show that during the last six months Congress enacted and the President approved 393 laws. These laws covered a wide range of subjects, and in their enactment there was involved the necessity for extended committee consideration, including the hearing of testimony by parties on both sides, and debate on the floors of both the Senate and House. Of outstanding interest was the revised tax bill, which reduced federal taxes and amended administrative provisions of the tax law, including the creation of a Board of Tax Appeals. Next in importance was the immigration restriction law, and in addition there were miscellaneous laws of an important character affecting various interests.

The law to amend the war minerals relief act by removing the limitation in the former law restricting payment of claims to $8,500,000 was one of the last measures to be approved by the President. Another bill affecting the mining industry, which would direct the Treasury Department to purchase 14,000,000 ounces of silver under the Pittman Act at $1 per ounce to cover allocations of silver for subsidiary coinage, which were subsequently revoked, failed of passage but is in committee subject to consideration before March 4. The Senate passed this bill late in May, but the House did not have time to consider it.

Among bills which failed to advance may be mentioned the proposed blue-sky law. This bill was debated in the House in March but not completed, and the bill was never again reached on the calendar. The bill to dispose of the Muscle Shoals project was passed by the House and has been scheduled for consideration by the Senate beginning December 3.

Neither House nor its committees reached consideration of the coal question. The Senate voted to print the reports of the Coal Commission, but too late to permit of action by the House. A bill was passed by the Senate to investigate the location and extent of potash deposits.

After an investigation of nearly three years the Commission on Reorganization of Government Departments reported a measure rearranging bureaus in various departments, under which the Bureau of Mines and the division in the Geological Survey which collects mineral statistics would be transferred from the Interior Department to the Department of Commerce.

Government ownership and operation of natural resources, including mining, where two or more companies produce 50 percent or more of the total output in an industry, was proposed in a bill introduced by Representative Berger, Socialist, Wisconsin. A number of bills were introduced for national mine expositions, including one in Spain in 1927 and one in the United States in 1930.

An import duty on copper of 6 cents per pound was proposed in a bill introduced by Representative James, Republican, Michigan, while other tariff proposals largely concerned relief for the agricultural industry, although some of them would exempt from tariff duty all articles imported from foreign countries in exchange for American farm products.

The railroad situation came in for extensive committee consideration and debate in both House and Senate, but no legislation thereon was enacted. The Senate passed a bill authorizing the Interstate Commerce Commission to revise the rate structure so that commodities may freely move at fair profit to railroads and at reasonable prices to shippers and consumers. The bill was passed by the House on the last day of the session, with amendments, but time did not permit of its enactment. Attempt was made in the House, without success, to discharge the Committee on Interstate Commerce from further consideration of a bill to abolish the Railroad Labor Board and to substitute

boards of mediation. A similar bill was reported by the Senate committee.

Congress passed a constitutional amendment which, if ratified by three-fourths of the states, will authorize Congress to limit, regulate and prohibit the labor of persons under 18. Bills were introduced to forbid the transportation of articles made by convict labor unless they are so marked.

The long fight to regulate the discharge of oil into navigable waters was partially won when Congress passed and the President approved a law to prevent the discharge of oil into coastal navigable waters. The bill will be administered by the War Department and will apply to vessels carrying oil or burning oil as fuel. It also authorizes the War Department to issue regulations regarding the handling, loading and unloading of oil. An appropriation of $50,000 is provided for investigations to ascertain what other substances pollute navigable waters, report on which is to be made within two years.

A number of bills were presented to define a policy regarding material resources during war, the object being to subject them to government conscription. One of these was called up for passage in the House at the eleventh hour, but was withdrawn after opposition had been expressed to attempts to control labor or materials during war. The resolution proposed a special investigation of the subject by a commission, but it was contended by the opposition that the matter could be looked into by the military committees of Congress.

MINING

War Minerals

S. 2797. Enacted into law. This is known as the amendment to the War Minerals Relief Act, which will enable the Interior Department to pay claims already authorized but held up on account of an approaching shortage of funds for their payment. The law provides as follows:

"That to enable the Secretary of the Interior to lawfully pay adjudicated claims arising under the provisions of the so-called War Minerals Relief Act, approved March 2, 1919, as amended, the limitation in said act on the aggregate amount to be disbursed thereunder ($8,500,000) in the payment of said claims is hereby repealed."

Silver Purchase

S. 2917. Passed by the Senate. Pending in the House Committee on Banking. This bill directs the Treasury Department to purchase, at $1 per ounce, under the Pittman law, 14,589,730 ounces of silver to cover allocations of silver for subsidiary coinage which were subsequently revoked by the Treasury.

Coinage

H. R. 9489. Introduced by Mr. Sweet (Rep., N. Y.). Referred to the Committee on Coinage. It proposes to coin 500,000 7½-cent pieces of 75 percent copper and 25 percent nickel, in memory of the late President Harding.

H. J. Res. 259. Passed by the House. It authorizes the coinage of 300,000 50-cent pieces, in commemoration of the one hundred and fiftieth anniversary of the battles of Lexington and Concord.

Potash

S. 3047. Passed by the Senate. It authorizes investigations by the Geological Survey and Department of Agriculture to determine the location and extent of potash deposits in the United States and improved methods of recovering potash. It proposes expenditures of $2,500,000 over a period of five years by the Geological Survey for a drilling campaign for potash in the natural state, and $250,000 for a similar period by the Department of Agriculture to conduct chemical and engineering researches of potash recovering processes from waste materials of blast furnaces, cement mills, etc. The bill provides that before undertaking drilling operations the Interior Department shall contract with the owners of lands to the effect that should potash or other valuable minerals be discovered, the Government shall be reimbursed for the actual cost of exploration. Owners of lands within 10 miles of a proposed drilling operation shall, in consideration of the increased value of their lands incident to discovery of potash, and to prevent profiteering, be required to agree to the designation of the Interior Department as referee in determining the maximum price at which the potash rights of the land are to be sold. Purchasers of such rights will be required to market potash at a price to be fixed by the Department, and shall pay 10 percent of their net profits to the Government annually until it is reimbursed for exploration expenses.

Topographical Survey

H. R. 4522. Reported by the Committee on Interstate Commerce. It appropriates $950,000 until June 30, 1925, under a plan to complete the topographical survey of the United States over a period of 20 years at a total cost of $37,200,000.

Mines Transfer

H. R. 9629. Reported to the House by the Committee on Reorganization of Government Departments. This bill rearranges the location of various bureaus within the government departments, and creates a new Department of Education and Relief, the latter covering care of disabled war veterans. To the new department is transferred the Public Health Service, which investigates matters concerning pollution of streams.

The Bureau of Mines and the Patent Office are transferred from the Interior Department to the Department of Commerce, effective July 1, 1925. To the Census Bureau of the Department of Commerce is transferred authority now exercised by the Geological Survey in the collection and publication of statistics of mineral resources and production. The bill establishes in the Department of Commerce a Bureau of Transportation, which will investigate all matters affecting facilities for interstate transportation by rail, highway, water and air, and make recommendations for development and improvement of transportation facilities.

In the Interior Department there is provided an assistant secretary for public domain and one for public works. The Board of Road Commissioners for Alaska, now under the War Department, is abolished, and its duties taken over by the Interior Department.

A Bureau of Purchase and Supply is created to handle all government purchases, to which is transferred the government fuel yards now under the Interior Department.

S. 3445. Reported to the Senate by the Committee on Reorganization of Government Departments. This is similar to the foregoing.

Resource Control

H. R. 9536. Introduced by Mr. Berger (Soc., Wis.). Referred to the Judiciary Committee. This bill provides for the government ownership and operation of industries, including mining, where two or more companies control 50 percent or more of the output of a commodity. It authorizes the creation of a Bureau of Industries in the Department of Commerce. If this bureau should report to Congress that the marketable output of any company, partnership, association or corporation engaged in manufacturing or mining a product for interstate transportation and sale, or any two or more such companies, control 50 percent or more of the output for the United States in the industry in which they are engaged, Congress shall select three members of the House and two of the Senate to take steps to take over such business and provide for its operation by the Government. This commission would appoint a receiver who would take possession of the business. The commission would appoint 12 experts to appraise the physical valuation of the tangible property, real and personal, of the plant. To provide for taking over the plant, the bill authorizes the commission to issue bonds in $50 denomina-

tions at 4 percent annual interest, which shall be offered in exchange at a pro rata value for the bonds of the company whose plants are taken over. If the owners refuse to surrender their properties, the President is authorized "to employ such means as may be necessary to take possession."

Upon transfer of ownership of the property to the Government, the plant would be managed by the Bureau of Industries, which is authorized to provide a sinking fund to retire the bonds in not more than 50 years. The bill also repeals the anti-trust law.

H. J. Res. 269. Introduced by Mr. Berger (Soc., Wis.). Referred to the Judiciary Committee. This bill provides for acquisition and conservation of the natural resources of the United States, by authorizing Congress to appoint a commission of 12 experts in the valuation of such properties who shall appraise their valuation through a sub-commission of five experts. It authorizes the commission to issue $50 bonds at 4 percent interest, to be offered in exchange for the securities of companies owning such properties. It authorizes Congress to create governmental agencies to operate natural resources as may require development, and to conserve others.

H. J. Res. 291. Introduced by Mr. Bacon (Rep., N. Y.). Referred to the Committee on Foreign Affairs. It recommends the calling of international conferences of all nations to consider economic questions, including the conservation of the remaining natural resources of the world and participation of the nations on an equal basis in the raw materials of the earth upon reasonable terms under equitable agreements.

Mine Exhibits

S. J. Res. 130. Passed by the Senate. It authorizes an appropriation of $700,000 for participation by the United States in an international exposition at Seville, Spain, beginning in April, 1927. It would include an exhibit by the Bureau of Mines, and General Land Office.

H. J. Res. 268. Reported by the Committee on Expositions. This is similar to the foregoing.

H. R. 9607. Introduced by Mr. Bloom (Dem., N. Y.). Referred to the Committee on Expositions. It proposes a government exposition of mine and other products in the United States in 1930, at a place to be designated by a commission of two representatives each from the various States.

Mine Trade

H. R. 9293. Introduced by Mr. Gibson (Rep., Vt.), by request. Referred to the Committee on Judiciary. It proposes to create a World Commerce Corporation for promotion of trade in mine and other products. The incorporators are named as Robert L. Luce, George P. Toby, Samuel C. Redman, George R. Wales and D. S. Fletcher. It proposes to organize this corporation as a national public service corporation to serve the industries and the public of the United States on a world-wide plan by producing or acquiring petroleum and other raw materials in foreign countries and supplying them to manufacturers, refineries and industries in the United States. It also proposes to establish fuel stations to facilitate transportation in foreign markets. It also proposes to drill for, mine, and produce petroleum, minerals, metals; and to acquire, operate and carry on refining and manufacturing plants. The total authorized capital stock of the corporation is fixed at $2,000,000,000, in $100 shares. A trustee stock of $100,000,000 is authorized, to be held by citizens of the United States only. The corporation would make an annual report to the Department of Commerce. Its principal office would be in Washington, D. C., with branch offices in other parts of the United States.

—Copyright, Kansas City Star.

On Guard

Mine Claims

H. R. 9400. Introduced by Mr. Wurzbach (Rep., Tex.). Referred to the Committee on Mines and Mining. This bill authorizes the exploration and purchase of mines within boundaries of private land claims. It provides that hereafter all gold, silver and quicksilver deposits or mines or minerals of the same on lands embraced within any land claim confirmed or hereafter confirmed by decree of the court of private land claims, and which did not convey the mineral rights to the grantee by the terms of the grant, and to which such grantee has not become otherwise entitled in law or in equity, shall be free and open to exploration and purchase under the mining laws of the United States, local mining laws and regulations, and regulations prescribed by the Interior Department, by citizens of the United States and those who have declared their intention to become such.

Any person qualified to acquire title to such mineral deposit under this act, who shall have first discovered and located any such mineral claim by posting notice of such discovery and location and by marking the boundaries by monuments on the surface, at any time since March 3, 1891, and prior to the passage of this act, shall within 90 days after the passage of this act, and any such discoverer and locator subsequent to the passage of this act shall within 90 days after the posting of the notice of location and marking the boundary of such claim, record the location notice in the office of the recorder of the county within which such claim is situated, and shall otherwise comply with the mining laws of the United States and the local laws and regulations, and in addition shall comply with regulations of the Interior Department.

Persons qualified to acquire title to such mineral deposits under this act shall have the right to enter in and upon the lands, if not cultivated and improved, embraced within private land claims, for the purpose of exploring and prospecting the same for such mineral deposits and posting notice and marking the boundaries of mineral claims to which he may seek title, and shall only

be liable to the owner of such land for actual damage done to the same.

Locators of such mineral claims shall within 90 days take steps to acquire right to use the surface ground embraced within such claim and access thereto, and are authorized to acquire the same by condemnation under judicial process. Before beginning such condemnation proceedings, the locator shall tender the land owner in which such mineral claim is located $2.50 an acre in full payment for the surface ground, and receipt of such sum by the land owner shall authorize immediate entry of the locator upon the land. The United States Circuit Court or District Courts of the district where the land is located shall have jurisdiction over such condemnation proceedings. The practice, pleading and mode of procedure arising in cases under this act shall conform to the practice existing at the time in cases for the condemnation of land for railroad purposes in State courts where such land is situated, any rule of the court or local law to the contrary notwithstanding.

Mineral Lands

S. 3412. Introduced by Mr. Smoot (Rep., Utah). Referred to the Committee on Public Lands. It relates to lands granted to the States, by providing that where such lands are found by a court or the Interior Department to have been of known mineral character at the time they were granted to the State, the holders of the land shall receive title thereto on payment of $1.25 per acre, but with reservation of the mineral deposits to the Government. Those to whom the lands are granted or who hold permits may, however, prospect for and mine minerals and have a preference right to a lease of the minerals from the Government. This provision will not apply to lands containing deposits of metalliferous minerals nor to lands withdrawn or reserved by the Government on account of their mineral deposits. Application to purchase or lease must be made within six months after determination by a court or the department affecting the lands and mineral deposits.

S. 3447. Introduced by Mr. Sheppard (Dem., Tex.). Referred to the Committee on Public Lands. It proposes an investigation by the Secretaries of the Interior, Agriculture and Labor of questions of land settlement, reporting within one year. The investigation would cover methods and results of unregulated private settlement, and methods of regulating land speculation, to prevent concentration of land ownership in a few hands.

Mine Leases

H. R. 6298. Enacted into law. It provides for leases for oil and gas mining for ten years and as long thereafter as the minerals are found in paying quantities on unallotted Indian reservation lands other than those of the Five Civilized and Osage Tribes. It is provided that the production of oil and gas and other minerals on such lands may be taxed by the State in which they are located.

H. R. 3852. Enacted into law. It provides for 25-year leases for oil, gas, coal and other mineral deposits on lands of the Eastern Band of Cherokee Indians of North Carolina.

S. 1653. Reported by the Committee on Indian Affairs. It provides that receipts from bonuses and royalties on oil and gas leases on the Navajo Indian Reservation in Arizona and New Mexico may be used by the Interior Department for supervision, development and operation of the oil and gas industry on the reservation.

S. 876. Reported by the Committee on Indian Affairs. It provides that receipts from bonuses, rentals and royalties on unallotted lands in Indian reservations shall be credited in the Treasury to the Indians at 4 percent annual interest, and shall be available for appropriation by Congress for the benefit of the Indians.

H. R. 2887. Enacted into law. It provides that the production of oil, gas and other minerals on restricted lands of the Kansas or Kaw Tribe of Indians in Oklahoma may be taxed by that State.

Oil Shale

The Senate passed an appropriation of $90,000 on a deficiency bill to enable the Bureau of Mines to develop oil shale, but the amendment was eliminated on objection by the House that the Bureau had already been given sufficient funds for oil-shale work in the Interior Department appropriation bill. This special fund had been recommended by the President's Oil Commission, and was transmitted through the Budget by the President to Congress two days before the session closed.

Oil Leases

S. Res. 147. Report thereon by the Committee on Public Lands. This report was submitted by Senator Walsh (Dem., Mont.), following the investigation which had been conducted since October as to leases on naval oil reserves. The report condemned the leases. A minority report was submitted by Senators Spencer, Missouri; Smoot, Utah; Stanfield, Oregon; Cameron, Arizona; and Bursum, New Mexico, Republicans.

Coal Commission

S. Con. Res. 3. Passed by the Senate. It provides for publication of the reports of the Coal Commission.

TAXATION

H. R. 6715. Enacted into law. This is the new tax revision bill, fully described in a separate article in this issue.

TARIFF

H. R. 9316. Introduced by Mr. James (Rep., Mich.). Referred to the Committee on Ways and Means. It proposes an import duty of 6 cents per pound on copper.

H. R. 9455. Introduced by Mr. Canfield (Dem., Ind.). Referred to the Committee on Ways and Means. It changes the duties on wire, by providing a duty of one-half cent per pound on galvanized wire for fencing and baling purposes.

H. J. Res. 284. Introduced by Mr. Rankin (Dem., Miss.). Referred to the Committee on Ways and Means. It proposes to exempt from tariff duty all articles imported from foreign countries which are exchanged for American farm products.

H. J. Res. 289. Introduced by Mr. Evans (Dem., Mont.). Referred to the Committee on Ways and Means. This is similar to the foregoing.

S. 3490. Introduced by Mr. Walsh (Dem., Mass.). Referred to the Committee on Appropriations. It proposes to appropriate $396,000 to enable the Tariff Commission to conduct investigations under the flexible tariff law. It was based on a report of the Commission which stated that present funds did not enable it to conduct investigations on applications for changes in duty on numerous articles, including mica, graphite, calcium arsenate, magnesite and pig iron.

TRANSPORTATION

S. J. Res. 107. Passed by Senate and House, but enactment not completed. This bill proposes to authorize the Interstate Commerce Commission to readjust freight rates to relieve the agricultural situation, which would also have the effect of changing rates on other commodities. The theory of the bill is that rates should be adjusted so that they will permit commodities to freely move at a fair profit to the railroads and at reasonable cost to shippers and consumers. In the House objection was made to the bill on the ground that it would authorize the commission to unduly lower freight rates on agricultural products and advance them on mine products.

S. 2646. Reported by the Committee on Interstate Commerce. This bill proposes to abolish the Railroad Labor Board and to substitute boards of mediation and conciliation to settle railroad labor disputes.

H. R. 7358. Introduced by Mr. Barkley (Dem., Ky.). On Mr. Barkley's motion, the House discharged its Committee on Interstate Commerce from consideration

of this bill, which is similar to the foregoing, but although it was debated at three separate daily sessions, its opponents prevented a vote.

H. R. 9298. Introduced by Mr. Cooper (Rep., Ohio). Referred to the Committee on Interstate Commerce. This bill proposes to abolish the Railroad Labor Board and to create a board of mediation and conciliation to settle railroad labor disputes.

LABOR

H. J. Res. 184. Enacted into law. It proposes a constitutional amendment, giving Congress power to limit, regulate and prohibit the labor of persons under 18. The power of the States will not be impaired except that the operation of State laws shall be suspended to give effect to legislation on this subject by Congress. If ratified by three-fourths of the States, the legislation will become effective throughout the country.

S. 3482. Introduced by Mr. Fess (Rep., Ohio). Referred to the Committee on Interstate Commerce. It would forbid the transportation in interstate commerce of articles made by convict labor unless such articles are marked to indicate the manner of their production.

H. R. 9491. Introduced by Mr. Parker (Rep., N. Y.). Referred to the Committee on Labor. This is similar to the foregoing.

IMMIGRATION

H. R. 7995. Enacted into law. This law, effective July 1, 1924, regulates the immigration of aliens into the United States. The number of immigrants to be admitted annually from any country is limited to 2 percent of the number of foreign born who were in the United States in 1890, with a minimum quota of 100 for any nationality.

H. R. 9775. Introduced by Mr. Kelly (Rep., Pa.). Referred to the Committee on Immigration. It proposes to create a commission on immigration policy of 12 members to investigate to determine a basis of selection of desirable immigrants; the influence of immigration on wages and American standards of living; needs of industry for foreign labor; and education of the foreign born. The commission would report within three years on a national immigration policy, based on a patriotic and scientific standard.

MISCELLANEOUS

S. 1942. Enacted into law. This law, which will be administered by the War Department, seeks to prevent the discharge by vessels burning oil or carrying oil from discharging such product into coastal navigable waters to an extent which will obstruct navigation or unduly pollute water. The discharge of oil would be forbidden, except in cases of emergency imperiling life or property, unavoidable accidents, collision, or stranding, and except as permitted by regulation of the War Department. The Department is authorized to prescribe regulations permitting discharge of oil from vessels in such quantities, under such conditions and at such times and places as will not endanger health, sea food, navigation, persons or property. The Department also would issue regulations for the loading, unloading and handling of oil. Violation of the law would subject the offender to a fine of from $500 to $2,500 or by imprisonment from 30 days to one year, or both, for each offense. The clearance of a vessel unlawfully discharging oil may be withheld until the penalty is paid. Penalties will not attach until September 7, 1924. The law also authorizes the War Department to investigate what polluting substances are deposited into navigable or non-navigable waters of the United States to an extent to cause danger or interference with navigation or fisheries, and to ascertain the sources of such pollution and by what means they are deposited. The Department is given $50,000 for this investigation, which must be reported on to Congress within two years, with recommendations for remedial legislation.

H. R. 9199. Reported by the Committee on Rivers and Harbors. This bill authorizes the War Department to prescribe regulations to prevent the pollution by oil of any navigable river by the discharge or draining of oil from any oil well, terminal, refinery, tank or place of storage. It would impose a fine of from $50 to $2,500.

H. R. 6645. Passed by the House. It creates within a prohibition bureau in the Treasury Department a Division of Industrial Alcohol and Chemistry, whose chief shall be a chemist with knowledge and experience in the manufacture, distribution and industrial uses of alcohol, at a salary of $7,500 a year. The division would administer the manufacture, distribution, sale and use of alcohol for non-beverage purposes so as to insure an ample supply and promote its use in scientific research and development of lawful industry.

H. R. 4830. Enacted into law. This law provides for protection of forest lands and extension of national forests. It is designed to protect water resources and to secure continuous production of timber. It appropriates $2,700,000. It authorizes the donation to the Government by private owners of lands chiefly valuable for growing timber, with reservation of the mineral rights in the lands to the owners for not more than 20 years. It exempts from new national forests lands containing phosphate and other mineral deposits, and water-power sites which have been reserved.

Power Development

H. R. 518. Reported by the Senate Committee on Agriculture. This is the bill passed by the House for the lease of the Muscle Shoals project to Henry Ford. It was amended by the Senate committee to provide for its operation by a federal power corporation. The bill will be considered by the Senate December 3. It was reported from the committee by Senator Norris, Republican, Nebraska, who says that in 10 or 20 years all water power east of the Mississippi River, together with numerous auxiliary steam plants located at coal mines, will be united into one giant power scheme, and that electrical power development should be under government supervision to prevent its monopolization by private industry. A minority report supporting the Ford offer was submitted by Senators Ladd, Republican, North Dakota; Smith, South Carolina; Harrison, Mississippi; Heflin, Alabama; and Caraway, Arkansas, Democrats.

H. R. 9674. Introduced by Mr. Richards (Dem., Nev.). Referred to the Committee on Irrigation. It proposes to carry out the project for development of power in the Colorado River by a commission of one member each from the seven States bordering the river, and a representative of the Interior Department. The commission would be authorized to operate a plant for the fixation of atmospheric nitrogen, to operate transportation service and transmission lines, and to construct a dam near Boulder Canyon for the generation of power for sale to industries. The bill appropriates $500,000.

H. R. 9458. Introduced by Mr. Watkins (Dem., Ore.). Referred to the Committee on Interstate Commerce. It provides for development of power and the production of nitrogen on the Columbia River. It appropriates $100,000,000.

S. 3328. Introduced by Mr. Ransdell (Dem., La.). Referred to the Committee on Commerce. It authorizes the Federal Power Commission to prepare a plan of development of water resources to provide electric power for farms, cities and industries.

War Control

H. J. Res. 285. Reported by the Committee on Rules and debated in the House, but withdrawn when opposition developed to its passage. This bill proposed to create a commission of five Senators and five Representatives to report in December, 1925, on plans to prevent profiteering in war and to mobilize material as well as human resources.

H. J. Res. 128. Reported by the Military Committee. It proposes a commission of four members of the House Military Committee, two members of the

Senate committee, the Secretaries of War, Navy and Commerce, and three persons representing labor, industry and capital, to report in December, 1924, on plans to mobilize all resources and to remove profit during war.

H. J. Res. 265. Introduced by Mr. LaGuardia (Rep., N. Y.). Referred to the Committee on Foreign Affairs. It requests the President to invite a world conference in Washington to outlaw war and to punish war profiteers.

H. J. Res. 266. Introduced by Mr. Thomas (Dem., Okla.). Referred to the Judiciary Committee. It proposes a constitutional amendment requiring a three-fourths vote of the House and Senate to declare war, and to give Congress power to prosecute war notwithstanding existing contracts made after ratification of the amendment.

H. J. Res. 271. Introduced by Mr. Taber (Rep., N. Y.), by request. Referred to the Committee on Judiciary. It proposes a constitutional amendment giving Congress power during war to conscript persons, money, industries and property.

Engineering Experiments

H. R. 9770. Introduced by Mr. Upshaw (Dem., Ga.). Referred to the Committee on Education. It proposes to establish State engineering experiment stations to promote industrial research and to make available the natural resources of the United States. It proposes to appropriate to each State for this purpose $30,000 for the first year, $40,000 for the second year, and $50,000 yearly thereafter. The work would be under the Department of Commerce, which would be given an annual appropriation of $50,000.

S. 3384. Introduced by Mr. Jones (Rep., Wash.). Referred to the Committee on Commerce. This bill proposes to enact into general legislation authority heretofore given in yearly appropriation laws for investigations by the Bureau of Foreign and Domestic Commerce, including investigations concerning mining in foreign countries, which may be of economic, commercial or industrial interest to the United States. A similar bill was defeated in the House.

S. 1005. Reported by the Committee on Judiciary. This bill proposes to make valid and enforceable written provisions or agreements for arbitration of disputes arising out of contracts, maritime transactions or commerce.

At the request of H. I. Smith, leasing supervisor for mining on public lands, J. E. Jones, safety engineer of the Old Ben Coal Corporation, spent a month in visiting mines in Colorado, New Mexico and Utah, advising operators on rock-dusting methods as used by the Old Ben Corporation.

TECHNICAL DIVISIONS REARRANGED

Bureau Of Mines Announces Changes In Its Divisions—Reassigns Work

UNDER an order approved by the Secretary of the Interior, the following-named technical divisions and offices of the Bureau of Mines have been recognized:

Division of Mining Experiment Stations, with administrative control of the stations at Pittsburgh, Pa.; New Brunswick, N. J.; Columbus, Ohio; Minneapolis, Minn.; Salt Lake City, Utah; Tucson, Arizona; Seattle, Wash.; St. Louis-Rolla, Mo.; Birmingham-Tuscaloosa, Ala.; Reno, Nev.; Berkeley, Calif.

Division of Metallurgy, charged with the conduct of researches in physics, chemistry and engineering connected with the metallurgy, ore dressing, reduction and refining of the ferrous and major non-ferrous metals; specifically of iron, steel, copper, lead, zinc, aluminum, gold, silver and their alloys. This division will be under the direction of the chief metallurgist who will have administative charge of the field studies now being conducted at Miami, Okla.; Moscow, Ida.; at the Massachusetts Institute of Technology, and at the Bueau of Standards; together with the cooperative studies on oxygen enrichment of air blasts.

Division of Mineral Technology, under the charge of the chief chemist.

Division of Fuels, under the charge of the chief mechanical engineer.

Division of Petroleum and Natural Gas, under the chief petroleum engineer.

Division of Mineral Leasing, to have charge of all work of the Bureau relating to leases other than oil and gas, on the public and Indian lands. This division will be under the direction of an engineer-in-charge, headquarters at Washington, who may serve coincidently as the chief mining supervisor.

Division of Mining Research, charged with the duty of conducting field and laboratory research as to mining methods in relation to safety, economy and efficiency in mining. This division will be under the supervision of an engineer-in-charge who will have technical supervision over all employes engaged in studies within its field and administrative control of the Urbana, Ill., staff, the Alaska staff, and such district and resident engineers as may be assigned to the work. The Division of War Mineral Supplies is abolished and its duties, records, and personnel are transferred to this division. The present chief of the Division of War Mineral Supplies is detached from duty and will report to the Director for special service.

The Safety Service, charged with the duty of disseminating throughout the mining and mineral industries the safety practices developed in or approved by the Bureau of Mines. This division will include the study, development and introduction of special mine rescue apparatus, the mine rescue work of the bureau, and the mine rescue and first aid training, the making of safety service reports, the holding of safety meets and rallies, and of mine rescue and first aid meets and contests, and all extension work of the bureau devoted to increasing safety in the mineral industries. It will be in charge of the safety service director.

Chief Surgeon's office, to be conducted by the chief surgeon, who will have technical supervision of all medical studies and studies of health hazards conducted by the bureau, and administrative control of all medical officers assigned to it. He will represent the bureau in cooperation with the Public Health Service.

Chief Explosives Chemists office, to be conducted by the chief explosives chemist, who will act as consultant in all studies of explosives conducted by the bureau, will approve all specifications for and tests made of permissible explosives, and will have technical supervision of the cooperation with the Army, Navy, and other departments or institutions where the work relates to explosives.

Two Administrative Divisions, consisting of the office of Chief Clerk and the Information Service, as now organized, shall be recognized.

The present Mine Safety Committee at the Pittsburgh station is abolished, and in lieu thereof there is constituted a general Mine Safety Board under the chairmanship of the chief mining engineer. It will include in addition the representatives of the Mine Safety and Mining Research Divisions and of the chief surgeon and the chief chemical engineer.

George S. Rice, chief mining engineer, is relieved of most of his administrative duties and will serve as advisor to the director and assistant director on mining matters with such special duties as may be from time to time assigned to him. For the present he will be in entire charge of matters relating to cooperation with the British government in studies of safety in mines. He will serve as chairman of the Mine Safety Board, and will have technical supervision over the studies conducted at the Experimental Mine at Bruceton, Pa.

RESEARCH IN BLASTING COAL

Little Research In Blasting Has Been Conducted By Coal Companies — Research Quickly Pays For Itself

By J. E. Crawshaw*

To obtain the best blasting results in any coal bed it is very evident that accurate data must be available of the effects of different methods of mining, and explosives of different physical properties. The correct way to obtain this data is through a series of systematic studies which will determine quantitatively the condition of the product obtained.

Little research work in blasting coal has been carried out in a systematic manner by the coal companies, and considering the amount of coal mined each year this would appear strange, as the advantages to be obtained from such work are large.

This condition has been brought about, no doubt, by the difficulty in arranging for these tests. Few mines are equipped so that an investigation could be carried out without considerable interference with their regular operation. While there probably have been quite a few investigations of blasting problems carried out by individual mining companies, there is no data generally available which gives accurate figures on the effect of variations in mining conditions, particularly on the percentage of lump coal obtained, which phase of the blasting problem—of special interest at the present time—is under consideration.

It is evident that to obtain such data and make it available for the whole coal mining industry is a big problem and will require several years to complete, as it means the carrying out of a large number of tests under carefully controlled conditions in a number of different coal beds. The effect of each change must be obtained from exact weights, as judging the result by the appearance of the coal is likely to be very misleading, as the presence or absence of a few large lumps influences the judgment of the observer.

The study of the factors influencing the production of lump coal now being carried on in the Pittsburgh district is only a start on this general problem. The Pittsburgh bed was chosen because of its uniformity, and its freedom from bands of slate and bone made it especially desirable for studying effects alone, without having to consider special conditions.

The investigation is being conducted by the Cooperative Mining Courses, Department of Mining, Carnegie Institute of Technology, and the Pittsburgh experiment station of the United States Bureau of Mines, in cooperation with the coal mining industry of western Pennsylvania. The work is being done by J. E. Tiffany, explosives testing engineer of the Bureau of Mines, and Charles W. Nelson, research fellow, Carnegie Institue of Technology. The fellowship and the expenses incidental to the carrying on of the investigation have been borne by the Hillman Coal & Coke Company, in whose Naomi mine the tests have been carried out.

Details and results of these tests will constitute a thesis by Mr. Nelson for the degree of Master of Science at Carnegie Institute of Technology, and later will be published as Bulletin 11 of the Coal Mining Investigations Series of Carnegie Institute of Technology, by Mr. Tiffany and Mr. Nelson.

A paper prepared by Messrs. Tiffany and Nelson describing the procedure followed in making the tests will be given by Mr. Nelson following this paper. The results which have been obtained so far during this investigation have been very encouraging, the percentage of lump coal having been increased from approximately 64.0 to 71.5, an increase of 7.5 percent.

The question naturally follows: "How generally applicable are the methods by which these results have been obtained?" There is no doubt that the methods can be applied directly to many of the mines in the Pittsburgh district working the Pittsburgh bed, and to many other mines where conditions are similar.

In addition, the principles brought out have general application in the blasting of coal. Of course, it may and probably will be necessary to make certain modifications, such as the location and number of holes, quantity and kind of explosive, to meet the conditions in a particular mine.

To point out in dollars and cents and show how quickly research in the blasting of coal can be made to more than pay for itself, the following facts are given:

The study in the Naomi mine was started about September 1, and to date 12 complete tests have been finished during the life of this fellowship. Yet figuring lump coal at $2.50 per ton and slack at $1.25 per ton, a 7.5 percent increase in the percentage of lump coal will increase the value of each 100 tons of coal mined $8.35.

This brings us to the consideration of the sources or causes of the slack, other than the machine cuttings, which represent approximately 6 percent of the "slack" obtained.

(1) In all mining problems the hard blasting is in getting an opening in the face to give the rest of the material room to move out. Once this opening is obtained, the blasting is relatively easy. Applied to coal mining, this would be the "tight" shot, which requires the larger charge to be effective. Further, the coal from the "tight" shot as it moves grinds and crushes itself from lack of space. The tests have shown that variations in methods at the "butt" shot have very little effect, and the larger part of the improvement was obtained at the "tight" shot.

(2) The second source is the explosive. It is generally known that the more explosive loaded in the coal the greater will be the amount of slack formed, as much of the power of the explosive is expended in the immediate vicinity of the explosive. Whether this explosive is present from overloading the holes or from poorly placed or poorly loaded holes, the result is the same. Accordingly, any change in methods of mining which will decrease the amount of explosive necessary to do the work will, as a result, decrease the amount of slack formed.

(3) The third cause is rate and method of application of the force of the explosive. A too rapid application increases the grinding and crushing as the coal moves out. A too small surface over which the application takes place requires higher charges or greater speed of application to bring out the coal.

These three factors have long been recognized as having an important bearing on the problem. But the individual effect of each has never been thoroughly investigated.

During this first year the work has been concentrated on studying the effect of methods of loading the explosive and the amount of explosive used. Only a very little work has been done on the varying of the position of the holes.

To complete the work on this bed (Pittsburgh bed), the effect of explosives of different physical characteristics and the position of the holes will have to be studied further, and the results obtained applied to a whole mine.

Investigations under special conditions such as where slate or bone bands are present, or thin beds, will also have to be carried out. However, it will not be

* Explosive Engineer, U. S. Bureau of Mines.

necessary to complete the Pittsburgh bed before starting this class of tests, as the work completed this year has given a good basis for branching out to other beds, at the same time continuing the present.

Part of this work it is expected will be carried out during the coming year, and it is believed that by applying the knowledge already acquired better results can be obtained under these other special conditions.

LUMP COAL AND BETTER BLASTING METHODS

Experiments In Springfield, Illinois, District—Bad Blasting Causes Great Financial Loss—Educational Campaign Should Be Inaugurated

By H. C. ADAMS*

THIS is a live subject and ought to be the one big effort on the part of all operators. Bad blastings is one of the greatest financial losses the operator is obliged to sustain. Every ton of screenings, whether 1¼ inches or 2 inches, made and sold represents a loss—in many cases this loss will run in excess of $1 per ton. As I pointed out in our discussion in Milwaukee last September, operators are altogether too lax. While we may reasonably expect a larger percentage of screenings under our present system of blasting than we had when coal was undercut, we are not obliged to accept the present condition as a fixture and grin and bear it.

I called attention to the clause in our contract with the miners which guarantees the support and cooperation of the organization in disciplining any miner who fails to properly mine, shoot and load coal. This, in most cases, is a dead letter. However, in Central Illinois, when all our coal is shot off the solid, we do not propose that it shall remain a dead letter. I think perhaps you will be interested in a short description of my efforts to get better shooting in my own mine.

After getting the opinions of practical miners in our field as to the possibilities of shooting, I started what we might call a campaign of education among our men. The mine some of the time was working half time which gave us a chance to inspect results of shots on idle days. Each mine manager visited all working places in his section on idle days and kept a record of the shots. The shots that were particularly bad were called to the miner's attention, and such suggestions were given as were thought to be helpful.

Following the next day's work, these same places were inspected, and if it was found that no improvement was noticeable in the shooting, the miner was again advised how to place his shots and notified that one more trial would be given him and that failure to improve meant discharge. Thus you will see effort was patiently made on the part of the company to assist the miner. A number of discharges were made and sustained. In some instances I think the men did not think the company was seriously in earnest and that the effort would be soon abandoned. In this they are mistaken. The company will follow this up more until such time as every miner will thoroughly understand that the contract is not a scrap of paper.

The operators have themselves to blame. After years of such a condition most of us made no effort to get better coal. We complained a lot about the increasing percentage, and that was about all. My observation is that a very large percentage of the men in the solid shooting mine today know little or nothing about mining. They make no study of the texture of the coal. They don't know, except in a general way, what will be the results of their shots, but to get some coal they use all the powder they please and trust to luck. Furthermore, the mine basis of settlement removes all incentive to produce good coal. A campaign of education seems to be the only method to correct this evil. This promises to be a tedious process but will succeed in the end. We are going to test several makes and sizes of powder. The manufacturers of powder are willing and anxious to give us the benefit of their expert experience in shooting, which should help.

The final analysis, however, as I see it, is a diplomatic, painstaking campaign of education. This will require special men, carefully selected, whose sole duty is to be devoted to this one effort. Our mine superintendents and managers have not the time to do this work properly. We have made some headway, and there are but few men who resent instruction. Such men it is best to get rid of. This move has not spread and become general in our field for the reason that I thought it best to try and work out some plan first. I also wanted to develop the position of the miners' officials regarding discharge for violation under the particular paragraph of the contract. The latter has worked satisfactorily.

It now seems to me that a general move on the part of all operators who pay for coal on a mine run basis should be made to secure the proper percentage of lump and screenings. Union officials recognize the handicap of excessive screenings, also powder-cracked lump. They also recognize that better preparation means better work for the men. Why, then, should we not insist that the agreement covering shooting be just as rigidly enforced as any other clause of our contract.

I shall try as soon as the mines in Central Illinois resume active operation to get the cooperation of all operators in this move, and I think all other mining sections should do the same. Don't depend on your mine officials to work out this change—select some good, practical men, and they will show you good results.

The system of paying for coal before screening was intended to obviate the many contentions incident to the use of screens and was not intended to encourage unworkmanlike methods of mining and blasting coal or to decrease the proportion of screened lump, and the operators are hereby guaranteed the hearty support and cooperation of the United Mine Workers of America in disciplining any miner who, from ignorance or carelessness or other cause, fails to properly mine, shoot and load his coal.

*President, H. C. Adams Coal Co.

COAL MINE SAMPLING

THE district and field engineers of the Bureau of Mines, Department of the Interior, who visit coal mines in connection with investigations of explosions, or regarding safety or economic conditions respecting conservation, or in the interest of any Government departments, are instructed to obtain samples of coal for analysis and to procure notes on the various features of the mine and its equipment. The samples taken are forwarded to the Pittsburgh testing station of the Bureau of Mines for analysis and the notes are kept on file at the same station for use in the preparation of material for publication with the coal analysis. A series of technical papers, covering the coal fields of each individual State, is being prepared. These papers include chapters on geology, mining, transportation, use and distribution, etc., together with the chemical analysis of the samples collected. Up to the present time, technical papers containing analyses of Iowa, Kentucky and Ohio coals have been published. Other technical papers containing analyses of Alabama, Virginia, Maryland, West Virginia, Pennsylvania, Tennessee, Utah, and Missouri coals will be published within the next few months. Analyses have been made of coals from Kansas, Indiana, North and South Dakota, Texas, Arizona. Colorado, Washington, Idaho, Wyoming, Montana and Illinois samples are being assembled. The entire coal fields of the United States are to be covered.

INCREASING LUMP COAL PRODUCTION BY CUSHIONED BLASTING

Advantages Of Cushioned Blasting Widely Recognized—Rock Dust Used In Stemming Increases Safety—Number Of Tests Outlined

By J. H. Horlick, Jr.
Manager Service Division, Hercules Powder Co.

"CUSHIONED" blasting has long been practiced by a few expert blasters, and its advantages have been rather widely recognized, if not practiced, by some well-informed shotfirers. The use of rock dust for stemming, as demonstrated by our experiments, increases the convenience and safety to such an extent that there seems to be no reason why this method, or some modification of it, should not be generally adopted.

Former methods of obtaining the cushioned effect by air spacing have involved refinements in tamping the charge which are difficult to have carried out in actual practice. With rock dust as stemming, the maximum cushioned effect is secured, and the tamping operation is even simpler than present practice. The procedure, in brief, consists in placing one or more cartridges of finely ground rock dust in the hole after the reduced explosives charge has been loaded. The explosives cartridges should not be slit or tamped, and the long cartridges of rock-dust stemming are merely shoved into the hole without tamping. It was found in the Ruhr mines that the explosion compresses the rock dust and wedges it tightly in the mouth of the hole so that none of the gases can escape until they have done their work in bringing down the coal. If, by any chance, a blown-out shot occurs, the rock-dust stemming helps to quench the flame. It is, therefore, a safety precaution, whereas coal dust frequently used for stemming is a real danger, and clay, though not a menace, has no flame-quenching properties. The compression of the rock-dust stemming by forming a long pressure chamber provides a greater area against which the gases can expand. In the following tests slight modifications were made in the method described by Stettbacher.

On the test in an Illinois coal mine, the explosive used was black powder. Here the coal is undercut 6 feet and the bottom holes drilled just above a blue band which occurs in the coal seam about 3 feet from the bottom. Usually a high percentage of screenings is produced by shooting those bottom or "snubbing" holes. In the method generally followed, an average of 30 inches of "F" blasting powder is used and tamped solidly. On our test shots with the cushioned method the charge was reduced to 20 inches of "C" blasting powder in cartridges of equal diameter to those used by the miners. After placing the 20 inches of powder in the hole without tamping it, cartridges of limestone dust about one-fourth or one-half inch less in diameter than the bore hole were inserted. This gave an air space above the entire length of the stemming. There was also an air space of 2 inches left between the powder charge and the first cartridge of rock dust. The end of the last cartridge of stemming was mashed so that it fitted snugly in the collar of the hole. The shots made by this method with about two-thirds of the usual powder charge brought down the coal satisfactorily with appreciably less screenings than are generally obtained.

On other tests in the Pittsburgh, Pa., district, more complete records were kept. In Mine No. 1 the coal is approximately 5 feet high with about 10 inches of slate above it. All of the coal is undercut and is blasted by two rib holes; shooting the tight rib first with two and a half to three cartridges of a permissible explosive 1¼ by 8 inches in diameter. The other butt shot is fired after the coal broken by the first one is removed. Ordinarily two to two and a half cartridges are used for the butt shots. The holes are 1¾ inches in diameter and 6 feet deep; the portion not occupied by the charge is tamped with moist clay stemming. In the tests tabulated below the finely ground limestone stemming was placed in the holes in two cartridges.

Clark patent tubing, 1½ inches in diameter, was used as a container for the dust and was cut to bring the end of the stemming 6 inches from the collar of the hole. The remaining portion of the hole was then firmly tamped with moist clay. After blasting with this method there was much less smoke than usual, and limestone dust was found distributed in the rooms, 50 feet and more from the face.

At Mine No. 2 lump coal is not the principal consideration but it is very important that all slate and other impurities occurring in a band of "bone" in the middle of the seam be separated from the coal. Any method that produces less pulverization of this slate helps materially at attaining good separation. Boreholes are 1¾ inches in diameter. The usual practice here is to drill one cuthole in the center and near the top of the seam (which is 6½ to 7 feet high) and to load it with four cartridges of a 1¼ by 8-inch permissible explosive. After removing the coal produced by this shot, a rib hole is fired with a charge of two and a half to three cartridges, and then a second rib hole containing two and a half cartridges. The total charge for a complete cut, therefore, usually is nine to nine and a half cartridges.

With the cushioned method, using rock-dust stemming the charges were reduced from 20 to 30 percent and it was quite apparent to the mine officials that the slate was brought down in larger pieces. The explosives charge was placed in the back of the hole and cartridges of shale dust were placed in the hole to within 6 to 10 inches of the collar. Neither the charge nor the rock-dust stemming was tamped. The small space at the collar of the hole was firmly tamped with moist clay.

The difficulty of comparing results obtained in one mine with those in another, because of the many variables which occur in nature, is well known. But even though the tests have not been on large tonnages and have not extended over long enough periods to make them absolutely conclusive, the better results obtained by the cushioned rock-dust method were obvious in each instance.

You may feel that the increased percentage of lump coal obtained on the tests I have described is the result of the reduced explosives charges and is to be expected no matter what the method of tamping. However, it was apparent to all the experienced men who witnessed the demonstrations that the improved results could not have been accomplished merely by using less powder; for when the amount of explosives usually necessary to pull down the coal without any overloading was tamped by the cushioned rock-dust method, the condition of the blasted coal clearly indicated an overload. The explosives charges used in our tests were less than could be relied upon to pull the coal with non-compressible tamping.

It was also observed that with the cushioned rock-dust method the desirable "spreading" effect heretofore considered attainable only with black powder was obtained with permissible explosives; and black powder when cushioned with rock dust gave better results than larger charges tamped in the usual manner.

PROCEDURE OF MAKING TESTS TO DETERMINE THE EFFICIENCY OF DIFFERENT METHODS OF BLASTING COAL

Various Tests Carried On At Coal Properties Explained—First Test Showed 64 Percent Lump Coal—Subsequent Tests Increased To 71.5, Decreasing Amount Of Explosives 30 Percent

By J. E. TIFFANY* and C. W. NELSON†

IN DETERMINING upon a method of procedure to determine the efficiency of different methods of blasting, it is essential to determine the fundamental factors involved when made under as nearly uniform conditions as possible and to eliminate from the tests as far as possible the effect of the natural variation in the coal bed. A section of the Naomi Mine of the Hillman Coal & Coke Company, Fayette City, Pa., was selected for the tests that have been made. The section chosen was in a solid block of coal, free from squeezes or other abnormal conditions. Each test was carried out in from four to six adjacent rooms with an average width of from 18 to 21 feet and driven on 39-foot centers. At the time of starting the tests the rooms had just been widened to their full width and advanced approximately the same distance into the solid block. The Pittsburgh bed in this mine is approximately 6½ feet thick, of which 6 feet is mined, the bottom 6 to 7 inches being high in sulphur. The location of the bottom of the undercut is determined by measuring 20 inches below the "3-foot binder." The undercutting was made with a Sullivan shortwall undercutting machine to a depth of 6½ feet, with a height at the face of about 6 inches and slightly less at the back of the cut.

As a basis of comparison for the tests, the percentage of lump coal obtained under the method of mining and blasting as used at this mine was first determined.

This method, with slight modifications, is that generally used in mines working the Pittsburgh bed, and briefly is as follows:

Two 2-inch rib holes, 12 inches from the rib and 24 inches below the "draw slate" are drilled parallel to the rib and pointing upward so that the back of the hole is at, or close to, the "draw slate." The depth of the holes is approximately 6 feet. Four sticks (approximately 1 1/3 pounds) of a permissible explosive were used in the "tight" shot and two and one-half to three sticks (¾ to 1 pound) in the "butt" shot. The cartridges are just pushed to the back of the hole. The balance of the hole is filled with moist clay stemming.

In the tests, variations were introduced in the position and direction of the holes and the method of loading the explosive. The percentage of lump coal obtained as a result of these tests was compared directly with that obtained under the usual conditions of blasting.

Records were kept of thickness of bed; width of room; location of the front and back of hole and the angle at which it was inclined to the rib and roof; the diameter and depth of hole; the length of the explosive charge and stemming; depth of undercut; kind of explosive and number of cartridges used and the density of loading; and general observations of the results of the shot.

The coal was loaded in the mine cars in the usual way, that is, no special precautions were made in handling the coal after a blast to increase lump coal production.

The total weight of coal mined and blasted for a test on which the result was based ranged from 284 tons to 465 tons. The average for the twelve tests made was 350 tons. The number of cuts for a test depended upon the weight of coal passing through a 1¼-inch bar screen. Two or three railroad cars were loaded with the screenings. Each test consisted of a number of complete cuts, varying from eleven to fifteen. The mine cars containing the test coal were tagged so that they could be identified and separated from the others at the tipple, where each car was weighed to the nearest 10 pounds. The total weight of coal mined in each test was thus determined. The coal was then dumped over a 1¼-inch bar screen, the screenings going into a separate railroad car set aside for this purpose. The weight of the screenings was obtained when the railroad cars were weighed. The difference between the total weight of coal mined as weighed at the tipple scales, and the screenings as weighed at the railroad scales, was taken as the lump coal produced and the percentage of lump coal computed.

It is felt that the results obtained in each test in which approximately 350 tons were mined, and in which a number of rooms were used, can be attributed directly to the variation introduced in a particular test and not from natural variations within the bed.

Under the method employed in the first test, the result of which was used as the standard, 64 percent lump coal was obtained. In subsequent tests, by varying the position of the holes, the method of loading the explosive, and the amount of explosive, the percentage of lump coal has been increased to approximately 71.5, a 7.5 percent increase. At the same time the amount of explosive has been decreased over 30 percent.

*Explosives Testing Engineer, U. S. Bureau of Mines.
†Research fellow.

LEAD IN 1923

CORRECTED returns from producers have necessitated a revision of the statistics of lead produced in the United States, compiled April 8 in the Geological Survey by C. E. Siebenthal and A. Stoll. The corrections, which relate to States and countries of origin of the lead, have been incorporated in the following statement. The statement issued April 8 should therefore be destroyed.

PRODUCTION OF REFINED PRIMARY LEAD IN THE UNITED STATES

	1921 (Short tons)	1922 (Short tons)	1923 (Short tons)
Domestic desilverized lead	187,962	185,191	291,760
Domestic soft lead	157,513	209,250	190,749
Domestic desilverized soft lead	52,747	74,305	61,332
	398,222	468,746	543,841
Foreign desilverized lead	50,367	63,916	74,481
Total refined primary lead	448,589	532,662	618,322
Antimonial lead	10,064	8,075	14,190

ENCLOSED LAMPS

An interesting but unhappy situation has developed in Oklahoma regarding the use of closed lights in mines in that State. State Mine Inspector Ed Boyle presented several new rules and regulations for coal mines to the Oklahoma operators at a meeting at McAlester, June 14. Rule 3 reads as follows:

Before closed lamps will be permitted to be installed by any operator in any mine in this State, the following preliminary conditions must be complied with:

(1) All mining machines used for undercutting coal must be of the closed type approved by the Bureau of Mines.

(2) No open-type motors must be installed except in places ventilated by inlet air currents and all switches, circuit breakers, or fuses must be enclosed in explosion-proof cases or break under oil.

(3) No trolley wires will be permitted to run beyond inlet air currents and all electric wires must be removed from returning airways.

Upon compliance with the foregoing requirements, the closed lamps cannot be installed and used until approved by the chief mine inspector, and in the event of their approval, until rules and regulations are promulgated governing the use of the same in each mine.

The operators feel that Mr. Boyle's idea is to make the introduction of closed lights impossible in Oklahoma.

OIL SHALE IN THE UNITED STATES

Greatest Industrial Need Is The Generation Of Power—Oil Shale Offers Guarantee For Centuries To Come Against Shortage Of Heat, Light Or Power For All Industrial Needs—800 Years' Supply In Colorado

By Victor C. Alderson
President, Colorado School of Mines

THE United States need have no fear, for centuries to come, of a shortage of heat, light or power for all domestic or industrial needs, provided available sources are properly developed. The greatest industrial need is the generation of power. This may be secured through the use of falling water, either in its direct local use as in the ordinary mills in the eastern states, or in the generation of electricity which can be transmitted long distances over power lines. Gas may be used either locally from gas wells or as a product of the distillation of coal. Coal, at the present time, is the greatest source of heat, light and power and must be reckoned with but it is bulky, dirty, and when used raw is economically wasteful. Besides, its production is so restricted by labor demands that the price has reached such an unbearable height that relief is sought. A substitute is to be found in the use of oil. There are two great sources of oil—from wells and from oil shale. Countries like Sweden, Germany, Australia, Tasmania and Brazil have no oil wells but great deposits of oil shale. These countries are now exploiting their oil shale deposits in order to secure a domestic supply of oil and to be independent of foreign supply. Other countries like Mexico, Russia, and Rumania have an excess of oil for export. The United States holds the premier position among all nations in that it has both an enormous supply of well oil and also the greatest supply of oil shale in the world. According to the estimate of the American Petroleum Institute the oil production of the world for 1923 was 1,010,995,000 barrels, of which the United States produced 735,000,000 barrels or 72.7 percent. Mexico produced 14,947,200 barrels. Thus we are the largest producers as well as the largest consumers of oil in the world. Our great well oil production, however, will not last. Evidently the peak of production is passed. The daily average production of 2,280,700 barrels on September 8, 1923, has dropped to 1,906,850 barrels on March 22, 1924. The alarm of a shortage of oil has been sounded. The joint committee of the United States Geological Survey and the Association of Petroleum Technologists, after a careful survey and analysis of the subject, estimated that 9,500,000,000 barrels of oil remained in the ground recoverable by present methods and that this supply would last approximately for 20 years. It is not to be assumed that this supply would be suddenly stopped; rather would the supply gradually diminish, increased intermittently by the discovery of new pools, but the decline would be gradual; at the same time there would be a gradual increase in the price of crude oil and its derivatives, like gasoline and lubricating oils. When this price increased to the point where substitutes could be obtained they would appear. The one great substitute for well oil is oil from shale, not to supplant well oil but to supplement it.

The records of well oil production show that the United States is the greatest oil producer in the world. I have made a careful study of the oil shale deposits in all other countries and can state, without any qualifying reserves whatever, that the United States has the most extensive, the richest, and the most accessible oil shale deposits in the world. As our supply of well oil diminishes we can turn to our oil shales as a secondary source so well defined, so easily estimated, and so certain of production that we can rest assured of a supply of oil to last almost indefinitely.

The oil shale deposits cover two great fields, the great eastern field within the states of Indiana, Ohio and Kentucky and the great western field within the states of Colorado, Utah and Wyoming. Besides, local deposits are found in California, Oregon, Nevada and Montana; in other states deposits are reported but are not corroborated.

Oil shale deposits in California occur at Riverside, at Casmalia in Santa Barbara County, and at Kittrick, near Bakersfield. The Riverside deposit has not been exploited. The Kittrick surface samples show an average yield of 60 gallons to the ton. The Casmalia deposit has been thoroughly examined and reported on by the California State Mining Bureau. The deposit is hundreds of feet in thickness and yields from 30 to 40 gallons of oil to the ton.

The best known deposit in Nevada is at Elko, although other deposits, notably at Carlin, are known to exist. The Catlin plant at Elko has the distinction of being the first oil shale reduction plant to operate on a commercial scale in the United States. A car load shipment of its lubricating oil, recently shipped to New York, found a good market.

The Oregon deposit, found near Ashland, covers several hundred acres, is reported to yield a large amount of oil, and has been developed to a depth of 200 feet.

The great eastern oil shale field is contained within the states of Kentucky, Indiana and Ohio. In early geologic time a great uplift occurred in this region called the Cincinnati uplift. The Devonian rocks were raised to the form of a flattened letter A. In succeeding ages erosion occurred leaving high bluffs, now appearing as the banks of streams, and exposing the underlying Devonian rocks. These bluffs are largely composed of oil shale. In Kentucky the eroded area comprises the famous blue grass region. The surrounding bluffs, 200 miles in length in and out, yield, on the average, oil to the amount of half a barrel to the ton. A conservative estimate of the total amount of oil recoverable by open cut methods is fully four times that of all the well oil estimated to remain in all the pools of the United States. A conservative estimate of the oil shale beds of Indiana is placed at 45 billion tons. The economic conditions affecting the development of the great eastern deposit are all favorable: that is, the immense deposits, cheap open cut mining, ample water supply, nearness to market and proximity to the great centers of population altogether make this deposit economically valuable, even though the average yield of oil is only one-half that of the western deposits.

The great western oil shale field covers the northwestern part of Colorado, the northeastern part of Utah, and the southwestern part of Wyoming. The Utah section is reached from Mack, Colo., by the Uintah Railway. Around Watson, Utah, are the huge deposits of oil shale that will yield up to 70 gallons of oil to the ton. The Wyoming section composes 3,500 acres, lies north of the Colorado line and south of the Union Pacific Railroad. The Colorado section is reached from Grand Valley or DeBeque, on the Denver and Rio Grande Western. South of the Grand River is the Grand Mesa with huge deposits of oil shale. North of the Grand River the oil shale is exposed on the banks of Parachute Creek and its tributaries north of Grand Valley and on the banks of Roan Creek and its tributaries north of DeBeque. To estimate in figures the total amount of oil shale available in all parts of the world would make the figures of German (*Continued on page* 333)

"PITTSBURGH PLUS" HEARING BEFORE TRADE COMMISSION

Federal Trade Commission Hears Argument On Steel Basing Point—Monopoly Not Charged—Practice Ably Defended

FOLLOWING argument by attorneys representing the government, steel interests, and intervening States, the Federal Trade Commission has taken under advisement its complaint against the U. S. Steel Corporation charging violation of law in the maintenance of the so-called Pittsburgh base plus price on steel. Because of the large record in this case and the important industrial interests involved, it may be some weeks before the commission announces its decision. The case has been pending for several years and it has been predicted that should the commission nullify the practice, the steel interests will appeal to the Supreme Court, which will further delay a settlement of the issue.

The crux of the commission's complaint is that in the case of the Pittsburgh plus price, no matter where the steel is manufactured outside of Pittsburgh (except at Birmingham), the customer pays the Pittsburgh base price, plus a fictitious freight on the steel from Pittsburgh to the point of destination. The commission contends that this freight is fictitious because the steel is not shipped from Pittsburgh and that no such freight charge is incurred. As an illustration, the commission states that in the case of steel selling at Pittsburgh for $30 per ton, the Minnesota Steel Company, one of the subsidiaries of the Steel Corporation, at Duluth, charges Duluth customers $43.20, the $13.20 being the fictitious freight charge extorted above the Pittsburgh price, it being alleged that the steel company pays no freight in this case but charges the customers an additional amount for alleged freight charges.

The burden of the argument of attorneys for the commission was that the effect of the Pittsburgh plus system is to substantially lessen competition in steel. It was contended that while freight rates determine a market, the Pittsburgh plus practice extinguishes it and creates an endless circle of constantly increasing handicaps. The commission's attorneys used the following trite phrases in describing the effect of the Pittsburgh plus practice:

"It builds a Chinese wall around the Chicago fabricator of bridges and building. The crumbs from the respondent's (Steel Corporation) table are picked up by independent structural companies."

It was charged that the Steel Corporation has an advantage because of the Pittsburgh plus practice when competing with fabricators, and that under the practice it has been impossible to develop a large structural business in Chicago. Another charge of the commission's attorneys was that $30,000,000 annually is extorted from farmers in eleven States by the Pittsburgh plus practice. It was contended that the Pittsburgh plus prices are not made in good faith to meet competition.

Monopoly Not Charged

The contention of the commission was supported by attorneys for the States of Illinois, Iowa, Minnesota, and Wisconsin. They contended that the practice was established in order to eliminate competition. They did not charge that the practice and the prices resulting therefrom are the result of a monopoly. They admitted that the commission could not order an equal mill base price or determine what prices shall be or the relation of prices of various mills. It was contended, however, that the Pittsburgh plus practice limits buyers to a single form of contract and retards the development of steel centers outside of Pittsburgh. It was made clear that the attack against the practice is not aimed at the dissolution of the Steel Corporation.

In defending the Pittsburgh plus practice, attorneys for the U. S. Steel Corporation declared that elimination of the practice would not increase competition. They held that the evidence in the case does not show violation of either the Clayton Act or the Federal Trade Commission act, under which the commission instituted the complaint. The steel attorneys said the evidence fails to support a conclusion that competition between consumers has been lessened by the practice, nor is there evidence that prices in the steel industry have been fixed by agreement, combination or understanding between the Steel Corporation and other producers. It was contended that if the construction placed by the attorneys for the commission on Section 2 of the Clayton Act should be sustained, it would render the act unconstitutional. The representatives of the Steel Corporation said the Pittsburgh practice does not establish a uniform delivered price for steel. "The Pittsburgh quotation is a convenience to the seller and buyer of steel," it was argued. "Prices realized by the Steel Corporation for products manufactured in western plants have been the natural market prices at the points of consumption and have in no way been affected by any alleged artificial system of pricing or selling. Prices realized by western producers have been the result of open, constant, active competition." It was contended that the adoption of a mill base system would be impossible as a practical matter. It was contended that the testimony introduced on behalf of the commission does not tend to prove violation of law. It was said that the assumptions on which testimony for the commission were based were erroneous and not supported by the testimony. The theory advanced by the experts has only an academic relation to competition as understood by business men and the courts. It was said that sales on delivered price are not hostile to competition as defined in the Clayton act. It was said that the contention of the commission that the Steel Corporation should sell steel at the same price f.o.b. Pittsburgh, Chicago, Duluth and Birmingham was repudiated by its experts.

"The sale of steel and the prices received by the Steel Corporation therefor are not based on any artificial system, but are determined by the same factors which govern the sale and price of other commodities," attorneys for the corporation said. It was argued that the producer nearest to the consumer is entitled to the benefit of his location.

Attorneys for the Steel Corporation said the argument of the commission is based on two erroneous premises:

"First, That a consumer of steel solely by reason of his proximity to a mill producing steel has a natural advantage which the producing mill is legally obligated to recognize in fixing the price; and

"Second, That the Steel Corporation is resticted in the independent adoption of any method of quoting and selling the steel they produce because other producers follow that method."

Gary Mis-Quoted

It was contended that the commission attorneys were in error in stating that Judge E. H. Gary, head of the Steel Corporation had testified that prices obtained by the western plants of the Steel Corporation are not the result of the law of supply and demand. It was said that the practice does not place a handicap upon western or southern consumers of steel.

A joint committee of civic organizations of Duluth joined the commission in arguing for abolition of the Pittsburgh plus practice on the ground that it had prevented that (*Continued on page* 334)

NATURAL RESOURCE INDUSTRIES ANALYZE COMMON PROBLEMS

NATURAL resource industries that produce the raw material for modern industry have developed to a position of great importance and with this position have come types of problems peculiar to these industries. Government control of natural resources, special taxes and special problems of trade associations in natural resource industries were discussed at the group meeting of the industries interested in the natural resources department, at the annual meeting of the Chamber of Commerce of the United States at Cleveland, May 7th. Representatives of the metal mining industries, coal, lumber, oil, natural gas, water power, in fact all industries that convert natural resources into a form for human use were present.

The general theme of the meeting and the work that is being carried on by the Natural Resources Department of the National Chamber were briefly stated by the chairman, Milton E. Marcuse, president of the Bedford Pulp and Paper Company of Richmond, Va., who represents the natural resources department on the board of directors of the National Chamber. He emphasized the growing appreciation by natural resource industries of the position they are taking today before the public because of the accelerated processes of modern industry, which have changed human society from an agricultural community to a highly specialized industrial community, consuming enormous quantities of raw materials, such as oil, copper, coal, lumber, etc. Besides the enormous demands on the great stable resources there are numerous raw materials required in modern industry which were unknown a few years ago. Many of these are in limited quantities. Modern transportation by the application of stored energy to man's use has made possible the transportation of raw materials from the ends of the earth, and with this process has come a struggle among nations to secure the advantages of natural resources. So that the problem arising in the field of natural resources is not only national but international.

The chairman stated that appreciating this development the National Chamber had established the natural resources department to study especially these problems, that it was the youngest of the eight departments in the Chamber representing American industries. During the year a bureau of agriculture had been added to the department under the direction of William Harper Dean, agriculturist of wide experience. The adoption of Referendum 42 which established a constructive national forestry policy for the nation was an outstanding accomplishment of the Chamber of special interest to natural resource industries.

The first speaker was James R. Garfield, ex-Secretary of Interior under President Roosevelt, on "Government Control of Natural Resources." As many of the principles which Mr. Garfield advocated as Secretary of the Interior have become law, such as the water power act, reclamation act, metal mining act, national forestry system, grazing system, his observations on the present attitude of the public toward natural resources were received with special interest. Mr. Garfield's main position was that the industrial age found America with what was considered an inexhaustible supply of natural resources and that our original policy was based upon this conception. Experience, however, has shown that our supplies are not inexhaustible and the national welfare requires a different handling of the subject from the original conception.

Conservation does not mean locking up natural resources or the destruction of the rights of property or individual initiative, but may require the formation of fair rules which shall apply to all alike to govern the handling of natural resources.

Mr. Garfield mentioned water power as a striking instance of this and recorded his approval of the water power act which was the result of twenty years' thought. He illustrated his position further by voicing opposition to any proposal to part with the power of Muscle Shoals not in compliance with the principles of the water power act, and for this reason he took exception to the Ford offer.

The special "Trade Association Problems of Natural Resource Industries" was discussed by Goldthwaite H. Dorr, of New York, who has had a wide experience in trade association matters and especially coal. He emphasized the need of modern industrial life of statistics if industry is to be conducted on its present large scale, and not to be a "poker game," or to be like a struggle of men, with knives, in the dark. Mr. Dorr attributed the activities of the Department of Justice against trade associations since the war as result of the public clamor to make a scapegoat of some agency for high prices. He believed that the principles enunciated by Secretary Hoover that trade associations should be permitted to gather statistics to be made available alike to the public and industry would ultimately prevail.

Characteristics of trade associations which are of common interest to natural resource industries are:

(1) The need of accurate information to prevent wastage in natural resources through recurrent cycles of over-production and uncertainty.

(2) The great number of units in these industries and dependence of small units on reliable information.

(3) The keen competition existing in standard raw material commodities because of their standard quality.

(4) Public misunderstanding of the fact that standardized articles ordinarily sell at uniform prices in the same market.

(5) That the national competitive price in a natural resource industry is one under which the substantial portion of the product sells at, or about, cost. The public, however, is disposed to measure costs and values on the bases of the costs of the industries most favorably situated.

Paul Armitage, chairman of the General Tax Committee of the American Mining Congress, spoke of "Taxation Problems in Relation to Depletion and Reserves of Natural Resources." He showed that the natural resource industries that are obliged to carry large reserves of natural resources as a reserve for their operations have a serious common problem in the danger of taxation levied especially at them. He called upon the natural resource industries to take joint action in studying and making plans to combat this danger.

OIL SHALE IN UNITED STATES

(*Continued from page* 331)

marks or even of astronomical calculations look like a primary arithmetical table. The following statement, however, can be grasped and is well beneath possibilities. If 100 plants were in operation, each treating 2,000 tons of oil shale a day, they would not exhaust the easily available supply in Colorado alone for 800 years.

NATURAL RESOURCES

In opening the Democratic national convention in New York June 24, Senator Harrison, of Mississippi, temporary chairman, said that party is a friend of business and "delights to see the reflected glory from burning furnaces * * * and the early bustle of mining camps." He charged that the natural resources of the country had been "dissipated and secretly squandered." He also charged that oil has been the "inspiration of the foreign and domestic policy of the administration."

AMADOR COUNTY

(*Continued from page* 317)

clays, sands, and fire brick from the Ione pits are recognized as the high-water mark of perfection by discriminating clay people. The production of clays and sands at Ione has been carried on over a number of years and the supply seems without limit.

The geographical facts concerning Amador County are always interesting. We find Amador to contain but 568 square miles. It is a wedge-shaped county that can be divided into three separate divisions. First, the clay banks and sand mines of Ione are found at an elevation of 291 feet; twelve miles further in the foothills we come to the Mother Lode running across the county its entire length of over thirty miles, the elevation here is 1,243 feet (at Jackson) and the third classification will be the Sierra Nevada Mountains that run across the county in its eastern end. In these parts Amador County is a vast playground of rugged mountain country, lakes and dashing streams. In 54 miles (the distance from Jackson to Silver Lake) elevation rises from 1,243 feet to 7,100 feet above sea level.

Tradition, historic atmosphere, and kindred things may play but a little part with some, but in various parts of California it does mean a great deal. We trust our visitors will find more about this during their brief sojourn with us. The hospitality of the pioneers is one of many institutions which we of the present day zealously cherish and endeavor to perpetuate, and in bidding the delegates to the Twenty-Seventh Convention of the American Mining Congress "Welcome to Amador County" we assure them a fitting reception awaits them, here, and all along California's golden Mother Lode.

GREATER SAFETY DISCUSSION

(*Continued from page* 316)

from these needs, which have, so far as relates to safety, been presented in general terms to this committee, there are the legislative matters already mentioned to which the attention of the committee is invited. Summarized they are:

"Provision authorizing the bureau to carry its message of safety direct to the mines and miners through exhibitions, field demonstrations and other means of permitting it to cooperate with the states and the industries in doing so.

"Provision authorizing publication of a brief annual directed specifically at safety and designed to be sent to the miners themselves.

"Provision for investigation of the manufacture, distribution and storage of explosives, as relate to safety.

"Authorizing such additional mine rescue cars and stations and mine safety instruction cars as Congress may from time to time provide."

"PITTSBURGH PLUS" HEARING

(*Continued from page* 332)

city from becoming a manufacturing center. The Duluth interests argued that Birmingham is favored by the practice and that production costs are not involved in the case.

A brilliant array of lawyers appeared in the argument of the case before the commission. For the Federal Trade Commission, W. H. Fuller, its chief counsel, and K. E. Steinhauer, one of its attorneys, argued in behalf of the commission's complaint. For the States of Illinois, Iowa, Minnesota and Wisconsin, H. G. Pickering conducted the case, and for the Duluth civic interests the attorneys were Charles P. Craig and George H. Spear. Counsel for the U. S. Steel Corporation were R. V. Lindabury, C. A. Severance, W. W. Collett, J. E. Ashmead and A. L. Mulling.

TRANSPORTATION ACT

(*Continued from page* 310)

mental legislation. Radical elements have ardently hoped that the railroads would suffer a breakdown that would compel the government to again assume control and that this ultimately would lead to public ownership of railroads, with communistic operation, such as that advocated by the conference for progressive political action which has called a conference at Cleveland for July 4. Supporters of this conference, most of whom are said to be supporters of Senator LaFollette, stand for the repeal of the Transportation Act and for public ownership.

The Transportation Act, therefore, remains practically unchanged and the opportunity for further trial before it is tampered with in any way is to be had notwithstanding the clamor of radical elements for its modification by the repeal of some of its most important provisions.

EDUCATION OF MINING ENGINEER

(*Continued from page* 301)

ing in general engineering subjects and the specialized courses in mining and metallurgy?

To include the college course does not necessarily mean that the graduate will enter on his work later in life. Preparatory education requires as much or more attention than any other. Who will say that the usual eight years of grammar school work cannot be done as effectively in six years? High school and preparatory school courses also need their share of attention. Progressive institutions are adopting higher standards with new and improved methods of teaching. Interest is being awakened by requiring students to prepare projects or themes on subjects related to mining and engineering work. Such instruction is more direct and combines theory and practice in such a manner as to stress the underlying basic principles.

Cooperation in Research and Training

Even in this brief paper mention should be made of the growing cooperation between the Bureau of Mines and various educational institutions in establishing graduate fellowships in mining, metallurgy and chemical research.* The same spirit of cooperation is being manifested between the mining schools and the mining industry, especially in the case of some of the larger mining companies that have established regular underground training for engineering students.†

There remain a number of subjects which are brought out in most discussions as essential to the education of a mining engineer of these, training in the use of correct English in writing letters and reports is the most generally recognized. Coupled with this is demanded the ability to write a brief but complete summary of any report made.

The history of the development of science and talks by prominent engineers, on their personal experience, will add an inspiration to the regular courses of study equalled only by that which comes from contact with the ablest teachers and the reading of such stimulating books as the autobiography of Michael Pupin in "From Immigrant to Inventor."

It is also recommended by many that a place be found for instruction in the fundamentals of business law, accounting and cost analysis. It seems necessary also that there should be an appreciation of the importance of human relations in industrial enterprises, especially in all questions affecting wages, working conditions, discipline and the discharge of employes.

The ability to cooperate enthusiastically with others is possibly one of the most important requirements of the mining engineer. It is exemplified in that quiet leadership which straightens out the tangles in the large or small organization and permits the best results to be obtained in any undertaking.

*E. & M. J. P., Vol. 115, page 1028.
†E. & M. J. P., Vol. 116, page 795.

BUYER'S DIRECTORY

ACETYLENE (Dissolved)
Prest-O-Lite Co., Inc., 30 E. 42nd St., N. Y. C.

ACETYLENE GAS
Prest-O-Lite Co., 30 East 42nd St., New York City.

ACID, SULPHURIC
Irvington Smelting & Refining Works, Irvington, N. J.

AERIAL TRAMWAYS
American Steel & Wire Co., Chicago and New York.

AIR COMPRESSORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

APPLIANCES, ENGINEERING
The Lunkenheimer Co., Cincinnati, Ohio.

AUTOMATIC CAGERS
Mining Safety Device Co., Bowerston, Ohio.

AUTOMATIC CAGE STOPS
Mining Safety Device Co., Bowerston, Ohio.

AUTOMATIC CAR CAGES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

AUTOMATIC FEEDERS
Mining Safety Device Co., Bowerston, Ohio.

AUTOMATIC (Mine Doors, Truck and Electric Switches)
American Mine Door Co., Canton, Ohio.

AUTOMATIC WEIGHING MACHINES
Streeter-Amet Weighing & Recording Co., Chicago, Ill.

BATTERIES (Storage, Gas Welding, Cutting, Dissolved Acetylene)
Prest-O-Lite Co., 30 East 42nd St., New York City.

BEARINGS (Ball)
Gurney Ball Bearing Co., Jamestown, N. Y.

BEARINGS (Roller)
Hyatt Roller Bearing Co., Harrison, N. J.

BELTING (Conveyor, Elevator, Transmission)
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

BELTING, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

BINS (Coke and Coal)
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

BIT SHARPENERS
Ingersoll-Rand Co., 11 Broadway, New York City.

BLASTING POWDER
Atlas Powder Co., Wilmington, Delaware.
Giant Powder Co., Con., 1st Nat'l Bank Bldg., San Francisco, Calif.
Hercules Powder Co., 934 King St., Wilmington, Del.

BLASTING SUPPLIES
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Giant Powder Co., Con., 1st Nat'l Bank Bldg., San Francisco, Calif.
Hercules Powder Co., 934 King St., Wilmington, Del.

BLOWERS (Disc)
J. C. Stine Co., Tyrone, Pa.

BLOWERS' CENTRIFUGAL
Ingersoll-Rand Co., 11 Broadway, New York City.

BOILER MOUNTINGS
The Lunkenheimer Co., Cincinnati, Ohio.

BOLTS & NUTS (Track)
Sweet's Steel Co., Williamsport, Pa.

BOLT-CLIPS (Tee Head)
Sweet's Steel Co., Williamsport, Pa.

BREAKERS (Construction and Machinery)
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Wilmot Engineering Co., Hazleton, Pa.

BRIQUETTING MACHINERY
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

BUCKETS (Elevator)
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CABLES (Connectors and Guides)
American Mine Door Co., Canton, Ohio.

CABLEWAYS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

CAGE (Safety Appliances)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Mining Safety Device Co., Bowerston, Ohio.

CAGERS, AUTOMATIC
Mining Safety Device Co., Bowerston, Ohio.

CAGES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

CAR AND CAR WHEELS
Hockensmith Mine Car Co., Penn Station, Pa.

CAR HAULS
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

CAR WHEEL BEARINGS
Hyatt Roller Bearing Co., Harrison, N. J.

CASTINGS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CHAINS
Jeffrey Mfg. Co., Columbus, Ohio.
Morse Chain Co., Ithaca, N. Y.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, N. Y.

CHAINS, COAL CUTTING
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

CHAINS, DRIVE
Morse Chain Co., Ithaca, N. Y.

CHAINS, FRONT END
Morse Chain Co., Ithaca, N. Y.

CHAINS, OILING
Morse Chain Co., Ithaca, N. Y.

CHAINS, POWER TRANSMISSION
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.
Morse Chain Co., Ithaca, N. Y.

CHAINS, SILENT (Rocker-Joint)
Morse Chain Co., Ithaca, N. Y.

CHAINS, SLING
Morse Chain Co., Ithaca, N. Y.

CHAINS, SPROCKET WHEEL
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.
Morse Chain Co., Ithaca, N. Y.

CHEMICALS
Roessler & Hasslacher Chemical Co., 709-717 Sixth Avenue, New York.

CHEMISTS
Hunt, Robt., Company, Insurance Exchange, Chicago, Ill.

CLAMPS (Trolley)
Ohio Brass Co., Mansfield, Ohio.

CLUTCHES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

COAL COMPANIES
General Coal Company, Land Title Bldg., Philadelphia, Pa.
Lehigh Coal & Navigation Co., Philadelphia, Pa.
Thorne, Neale & Co., Philadelphia, Pa.
Bertha-Consumers Company, Chamber of Commerce Bldg., Pittsburgh, Pa.

COAL CRUSHERS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

COAL CUTTERS
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

COAL HANDLING MACHINERY
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

COAL MINING MACHINERY
Goodman Mfg Co., Halsted St. and 48th Pl., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

COAL MINING PLANTS
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

COCKS (Locomotive, Cylinder and Gauge)
The Lunkenheimer Co., Cincinnati, Ohio.

COMPRESSORS, AIR
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

COMPRESSORS, MINE CAR
Ingersoll-Rand Co., 11 Broadway, New York City.

CONCENTRATORS (Table)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CONCRETE REINFORCEMENT
American Steel & Wire Co., Chicago and New York

CONDENSERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

CONTROLLERS
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

CONVERTORS, COPPER
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CONVEYOR BEARINGS
Hyatt Roller Bearing Co., Harrison, N. J.

CONVEYORS, BELT
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CONVEYORS, CHAIN FLIGHT
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Wilmot Engineering Co., Hazleton, Pa.

CONVEYORS, COAL
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

CONVEYORS AND ELEVATORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CONVEYORS, PAN OR APRON
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CONVEYORS, SCREW
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CORE DRILLING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.

COUPLINGS (Flange)
W. A. Jones Foundry & Machine Co., 4440 W. Roosevelt Rd., Chicago, Ill.

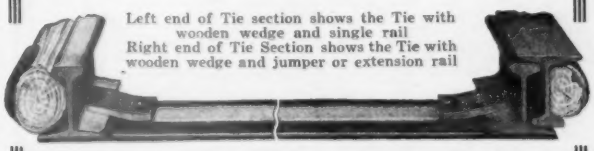
CRUSHERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CRUSHERS, COAL
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CRUSHING PLANTS, COKE
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

CYANIDE
American Cyanamid Co., New York, N. Y.
Roessler and Hasslacher Chemical Company, 709 Sixth Avenue, New York City.

DESIGNERS OF PLANTS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.



DIAMOND CORE DRILL CONTRACTING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.

DOORS, AUTOMATIC MINE
American Mine Door Co., Canton, Ohio.

DREDGES, GOLD AND TIN
New York Engineering Co., 2 Rector St., New York City.

DRIFTERS, DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS, AIR AND STEAM
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Blast Hole)
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS, CORE
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS, ELECTRIC
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

DRILLS, HAMMER
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Hand Operated Coal)
Ohio Brass Co., Mansfield, Ohio.

DRILLS, PNEUMATIC
Denver Rock Drill Mfg. Co., Denver, Colo.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS, PROSPECTING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
New York Engineering Co., 2 Rector St., New York City.

DRILLS, ROCK
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

DRILL STEEL SHARPENERS
Ingersoll-Rand Co., 11 Broadway, New York City.

DRIVES, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

DRUMS (Hoisting, Haulage)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

DUMP CARS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

DYNAMITE
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Giant Powder Co., Con., 1st Nat'l Bank Bldg., San Francisco, Calif.
Hercules Powder Co., 934 King St., Wilmington, Del.

DYNAMOS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

ELECTRICAL APPARATUS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

ELECTRICALLY OPERATED VALVE
The Lunkenheimer Co., Cincinnati, Ohio.

ELECTRIC HOISTING MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

ELECTRIC LOCOMOTIVES
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Ohio Brass Co., Mansfield, Ohio.

ELECTRIC MINE SUPPLIES
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

ELECTRICAL SUPPLIES
General Electric Co., Schenectady, N. Y.

ELEVATORS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

ELEVATORS, BUCKET
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

ELEVATOR MACHINERY
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

ENGINE TRIMMINGS
The Lunkenheimer Co., Cincinnati, Ohio.

ENGINEERING APPLIANCES
The Lunkenheimer Co., Cincinnati, Ohio.

ENGINES
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

ENGINES, GAS AND GASOLINE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINES (Hoisting and Hauling)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

ENGINES, OIL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINES, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINEERS
H. R. Ameling Prospecting Co., Rolla, Mo.
Hunt, Robert Company, Insurance Exchange, Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., Wilmington, Del.
Giant Powder Co., Con., 1st Nat'l Bank Bldg., San Francisco, Calif.
Hercules Powder Co., 934 King St., Wilmington, Del.

FANS, VENTILATING
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
General Electric Co., Schenectady, N. Y.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

FEEDERS, ORE
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

FLOTATION MACHINES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FLOTATION OILS
Hercules Powder Co., 934 King St., Wilmington, Del.

FLOW METERS
General Electric Co., Schenectady, N. Y.

FORGINGS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FURNACES, MECHANICAL ROASTING
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

GAS (Cutting, Welding)
Prest-O-Lite Co., Inc., 30 E. 42nd St., New York City.

GAS (Nitrogen, Oxygen)
Linde Air Products Co., 30 E. 42nd St., New York City.

GEARS
General Electric Co., Schenectady, N. Y.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

GEARS, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

GENERATORS AND GENERATING SETS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

HANGERS (Insulated Trolley)
Ohio Brass Co., Mansfield, Ohio.

HANGERS (Post)
W. A. Jones Foundry & Machine Co., 4440 W. Roosevelt Rd., Chicago, Ill.

HEADLIGHTS, ARC AND INCANDESCENT
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Ohio Brass Co., Mansfield, Ohio.

HOISTS, ELECTRIC
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.
J. C. Stine Co., Tyrone, Pa.

HOISTS, PORTABLE
Ingersoll-Rand Co., 11 Broadway New York City.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

HOISTS, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

HOISTS (Room and Gathering)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Lidgerwood Mfg. Co., 96 Liberty St., New York City.

HOISTING ROPES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

HOSE, AIR AND STEAM
Ingersoll-Rand Co., 11 Broadway, New York City.

INCLINE PLANE MACHINERY
J. C. Stine Co., Tyrone, Pa.

INSTRUMENTS, ELECTRICAL
General Electric Co., Schenectady, N. Y.

INSULATING MATERIAL, ELECTRIC
General Electric Co., Schenectady, N. Y.

INSULATING TAPE AND CLOTH
General Electric Co., Schenectady, N. Y.

INSULATORS, FEEDER WIRE
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS, SECTION
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Porcelain)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Third Rail)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Trolley)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATED WIRE AND CABLE
American Steel & Wire Co., Chicago, Ill.
Roebling Sons, John A., Trenton, N. J.

KILNS (Rotary)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

LAMPS, ARC AND INCANDESCENT
General Electric Co., Schenectady, N. Y.

LAMPS (Carbide)
Wolf Safety Lamp Co. of America, Inc., 220 Taaffe Place, Brooklyn, N. Y.

LAMPS (Carbon)
General Electric Co., Schenectady, N. Y.

LAMPS, ELECTRIC
General Electric Co., Schenectady, N. Y.

LAMPS (Safety)
Wolf Safety Lamp Co. of America, Inc., 220 Taaffe Place, Brooklyn, N. Y.

LEAD ORES
American Zinc, Lead & Smelting Co., 1012 Pierce Bldg., St. Louis, Mo.

LIGHTNING ARRESTERS
General Electric Co., Schenectady, N. Y.

LOADERS (Mine Car)
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

LOADING BOOMS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

LOADING MACHINES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Jeffrey Mfg. Co., 938 N. 4th St., Columbus, O.

LOCOMOTIVES, ELECTRIC
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

LOCOMOTIVES, RACK RAIL
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

LOCOMOTIVES, STORAGE BATTERY
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Mancha Storage Battery Locomotive Co., St. Louis, Mo.

MACHINERY, TRANSMISSION (Power)
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.
Morse Chain Co., Ithaca, N. Y.

MILLS, ROD & BALL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MILLS, STAMP
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MINE CAR BEARINGS
Hyatt Roller Bearing Co., Harrison, N. J.

MINE DOORS, AUTOMATIC
American Mine Door Co., Canton, Ohio.

MINING & METALLURGICAL MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MINING EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

MINING MACHINES
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

MINING MACHINES CHAIN AND PUNCHER
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

MINING MACHINES (Electric)
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

MINING MACHINERY
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

MINE CAR HITCHINGS
Hockensmith Wheel & Mine Car Co., Penn Station, Pa.

MINE CAR TRUCKS
Hockensmith Wheel & Mine Car Co., Penn Station, Pa.

MINE SIGNALS
American Mine Door Co., Canton, Ohio.

MOTORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

MOUNTINGS, BOILER
The Lunkenheimer Co., Cincinnati, Ohio.

NITROGEN GAS
Linde Air Products, 30 East 42nd St., New York City.

NON-RETURN BOILER STOP VALVES
The Lunkenheimer Co., Cincinnati, Ohio.

ORE, BUYERS AND SELLERS OF
Irvington Smelting & Refining Works, Irvington, N. J.
Phelps-Dodge Corporation, New York City.

OXYGEN GAS
Linde Air Products, 30 East 42nd St., New York City.

PACKINGS
Greene, Tweed & Co., 109 Duane St., New York City.

PATENT ATTORNEY
John Boyle, Jr., Ouray Bldg., Washington, D. C.

PERMISSIBLES, Explosives
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Giant Powder Co., Con., 1st Nat'l Bank Bldg., San Francisco, Calif.
Hercules Powder Co., Wilmington, Del.

PICKING TABLES
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

PIPE, CAST IRON
Hockensmith Mine Car Co., Penn Station, Pa.

PIPE (Wood)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

PNEUMATIC TOOL
Ingersoll-Rand Co., 11 Broadway, New York City.

POWDER, BLASTING
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Giant Powder Co., Con. 1st Nat'l Bank Bldg., San Francisco, Calif.
Hercules Powder Co., 934 King St., Wilmington, Del.

POWER TRANSMISSION MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

PROSPECTIVE DRILLS
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

PULLEYS (Cast Iron)
W. A. Jones Foundry & Machine Co., 4440 W. Roosevelt Rd., Chicago, Ill.

PULVERIZERS, COAL AND COKE
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

PUMPS, AIR LIFT
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, CENTRIFUGAL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, MINE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
J. C. Stine Co., Tyrone, Pa

PUMPS (Electric)
Allis Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
J. C. Stine Co., Tyrone, Pa.

PUMPS (Gathering or Dip)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

PUMPS, PNEUMATIC AIR LIFT
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, POWER
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, SAND
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, STEAM
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, VACUUM
Ingersoll-Rand Co., 11 Broadway, New York City.

QUARRYING MACHINERY
Ingersoll-Rand Co., 11 Broadway, New York City.

RAIL BONDS
American Steel & Wire Co., Chicago and New York.
Ohio Brass Co., Mansfield, Ohio.

RAILS, STEEL (Heavy and Light Sections)
Sweet's Steel Co., Williamsport, Pa.

RAILWAY SUPPLIES
Ohio Brass Co., Mansfield, Ohio.
Sweet's Steel Co., Williamsport, Pa.

RELIEF VALVE
The Lunkenheimer Co., Cincinnati, Ohio.

RETARDERS
Mining Safety Device Co., Bowerston, Ohio.

ROCK DRILLS
Ingersoll-Rand Co., 11 Broadway, New York City.
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

ROLLER BEARINGS
Hyatt Roller Bearing Co., Harrison, N. J.

ROLLS (Crushing)
Allis Chalmers Mfg. Co., Milwaukee, Wis.
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

ROPE, TRANSMISSION
American Steel & Wire Co., Chicago and New York.
Roebling Sons, John A., Trenton, N. J.

ROPE, WIRE
American Steel & Wire Co., Chicago and New York.
Roebling Sons, John A., Trenton, N. J.

SAFETY APPLIANCES, MINE
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

SCRAPER LOADERS
Goodman Mfg Co., Halsted St. and 48th Place, Chicago, Ill.

SCREENS AND PERFORATED SHEETING
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

SEARCHLIGHTS
General Electric Co., Schenectady, N. Y.

SHARPENERS, DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

SIGNS (Mine)
Stonehouse Signs, Inc., 842 Larimer St., Denver, Colo.

SINKERS, ROCK DRILL
Ingersoll-Rand Co., 11 Broadway New York City.

SKIPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

SMELTERS
Irvington Smelting & Refining Works, Irvington, N. J.

SPEED REDUCERS
W. A. Jones Foundry & Machine Co., 4440 W. Roosevelt Rd., Chicago, Ill.

SPIKES (Track)
Sweet's Steel Co., Williamsport, Pa.

SPLICE, CABLE
Amercian Mine Door Co., Canton, Ohio.
Ohio Brass Co., Mansfield, Ohio.

SPLICE, INSULATOR
American Mine Door Co., Canton, Ohio.

SPLICE, TROLLEY WIRE
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

SPLICE BARS (Plain and Angle)
Sweet's Steel Co., Williamsport, Pa.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, N. Y.

SPROCKETS, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, N. Y.

STEEL, HOLLOW & SOLID DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

STEEL, REINFORCING
American Mine Door Co., Canton, Ohio.

STOPERS, ROCK DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

STORAGE BATTERY LOCOMOTIVES
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Mancha Storage Battery Locomotive Co., St. Louis, Mo.

SWITCHBOARDS, POWER
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

SWITCHES (Disconnecting and Electric)
General Electric Co., Schenectady, N. Y.

SWITCHES AND FROGS, TROLLEY
American Mine Door Co., Canton, Ohio.
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

TIES (Steel, Mine)
Sweet's Steel Co., Williamsport, Pa.

TIMBER PRESERVING EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

THE OLD MINE MULE

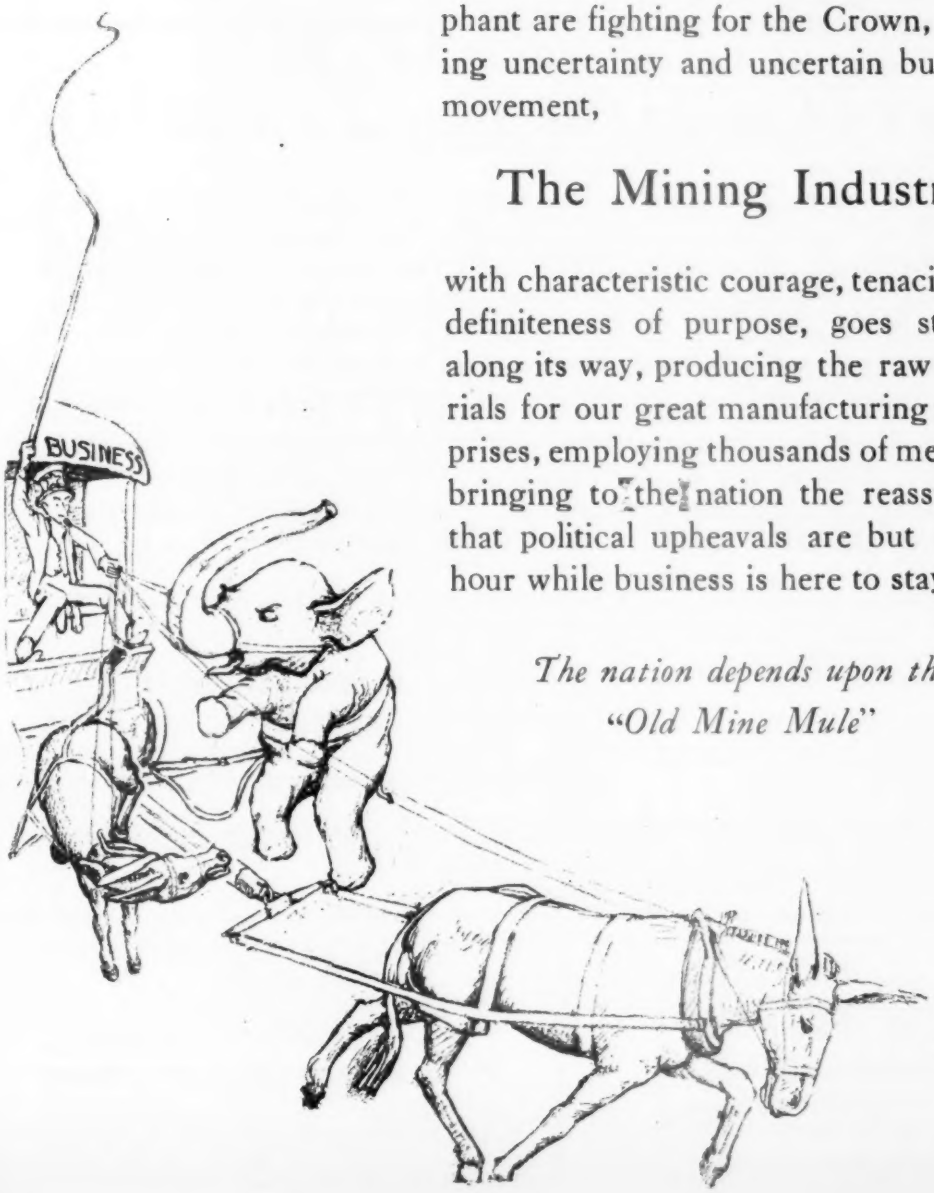
while antedated, and now personified by the modern locomotive—can be depended upon to keep the wheels of industry moving.

While the political Donkey and the Elephant are fighting for the Crown, causing uncertainty and uncertain business movement,

The Mining Industry

with characteristic courage, tenacity and definiteness of purpose, goes steadily along its way, producing the raw materials for our great manufacturing enterprises, employing thousands of men, and bringing to the nation the reassurance that political upheavals are but of the hour while business is here to stay.

The nation depends upon the "Old Mine Mule"



TIPPLES
Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

TIPPLE EQUIPMENT
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
The Mining Safety Device Co., Bowerston, Ohio

TRACK (Portable, assembled and unassembled, riveted or bolted)
Sweet's Steel Co., Williamsport, Pa.

TRACKS, PORTABLE, RAIL, ETC.
West Virginia Rail Co., Huntington, W. Va.

TRACK SUPPLIES
Sweet's Steel Co., Williamsport, Pa.

TRAMWAYS
A. Leschen & Sons Rope Co., St. Louis, Mo.

TRANSFORMERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

TRANSMISSION, SILENT CHAIN
Morse Chain Co., Ithaca, N. Y.

TRIMMINGS, ENGINE
The Lunkenheimer Co., Cincinnati, Ohio.

TROLLEY FROGS
Ohio Brass Co., Mansfield, Ohio.

TROLLEY (Hangers and Clamps)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

TROLLEY MATERIAL, OVERHEAD
Ohio Brass Co., Mansfield, Ohio.

TROLLEY WHEELS AND HARPS
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Ohio Brass Co., Mansfield, Ohio.

TURBINES, HYDRAULIC
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TURBINES, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

VALVES
The Lunkenheimer Co., Cincinnati, Ohio.
Ohio Brass Co., Mansfield, Ohio.

WAGON LOADERS
Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

WASHERIES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

WATER RELIEF VALVES
The Lunkenheimer Co., Cincinnati, Ohio.

WEIGHING MACHINES (Automatic)
Streeter-Amet Weighing & Recording Co., Chicago, Ill.

WEIGHT RECORDING MACHINES (Automatic)
Streeter-Amet Weighing & Recording Co., Chicago, Ill.

WELDING APPARATUS, ELECTRIC ARC
Ohio Brass Co., Mansfield, Ohio.

WHISTLES
The Lunkenheimer Co., Cincinnati, Ohio.

WIRE AND CABLE
American Steel & Wire Co., Chicago and New York.
Roebling Sons, The John A., Trenton, N. J.

WIRE ROPE FITTINGS
American Steel & Wire Co., Chicago and New York.

ZINC ORES
American Zinc, Lead & Smelting Co., 1012 Pierce Bldg., St. Louis, Mo.

American Mining Congress

OFFICERS AND COMMITTEES, 1924

OFFICERS

H. W. Seaman, *President*
Daniel B. Wentz, *First Vice-President*
E. L. Doheny, *Second Vice-President*
L. S. Cates, *Third Vice-President*
J. F. Callbreath, *Secretary*

DIVISION STAFF

E. C. Porter, *Convention Manager*
George H. Bailey, *Counsel*
H. W. Smith, *Chief Mineral Tariffs Division*
M. W. Kriegh, *Tax Division*
E. H. Pullman, *Chief Publicity Department*
E. R. Coombes, *Asst. to Secretary*

DIRECTORS

W. J. Loring, San Francisco, Calif.
Bulkeley Wells, Denver, Colo.
Sidney J. Jennings, New York, N. Y.
Daniel B. Wentz, Philadelphia, Pa.
Albert J. Nason, Chicago, Ill.
Wm. H. Lindsey, Nashville, Tenn.
J. G. Bradley, Dundon, W. Va.
H. W. Seaman, Chicago, Ill.
E. L. Doheny, 120 Broadway, New York City.
Hugh Shirkie, Terre Haute, Ind.
Stanly Easton, Kellogg, Idaho.
F. L. Morse, Ithaca, N. Y.
L. S. Cates, Salt Lake City, Utah.

EXECUTIVE COMMITTEE

H. W. Seaman — Sidney J. Jennings
Albert J. Nason

COMMITTEES

COOPERATION

AMERICAN MINING CONGRESS AND AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

A. M. C.

A. Cressy Morrison, 42d St. Bldg., New York City.
J. E. Spurr, Hill Bldg., New York City.
W. R. Ingalls, 115 Broadway, New York City.
J. R. Finlay, Room 802, 45 Cedar St., New York City.
Daniel B. Wentz, Land Title Bldg., Philadelphia, Pa.

A. I. M. & M. E.

E. P. Mathewson, 42 Broadway, New York City.
W. L. Saunders, 11 Broadway, New York City.
Walter Douglas, 99 John St., New York City.
Benjamin B. Thayer, 25 Broadway, New York City.
Samuel Taylor, Second National Bank Bldg., Pittsburgh, Pa.

ALASKAN AFFAIRS

John A. Davis, Fairbanks, Alaska.
Falcon Joslin, 2203 L. C. Smith Bldg., Seattle, Wash.
Bart L. Thane, 408 Crocker Bldg., San Francisco, Calif.

MINING IN FOREIGN COUNTRIES

J. E. Spurr, *Chairman*, Hill Bldg., New York City.
Van H. Manning, 15 West 44th St., New York City.
E. L. Doheny, 120 Broadway, New York City.
W. J. Loring, Crocker Bldg., San Francisco, Calif.
Matthew C. Fleming, New York City.
H. Foster Bain, Bureau of Mines, Wash., D. C.

ADVISORY COMMITTEE UNITED STATES BUREAU OF MINES AND GEOLOGICAL SURVEY

Bulkeley Wells, *Chairman*, Denver, Colo.

Walter Douglas, New York City.
Rembrandt Peale, New York City.
H. Foster Bain, U. S. Bureau of Mines, Washington, D. C.
George Otis Smith, U. S. Geological Survey, Washington, D. C.

DEPARTMENT OF MINES AND MINING

W. J. Loring, *Chairman*, San Francisco, Calif.

Walter Douglas, New York City.
Bulkeley Wells, Denver, Colo.
George H. Crosby, Duluth, Minn.
D. C. Jackling, Hobart Bldg., San Francisco, Calif.
Carl Scholz, Charleston, W. Va.
S. D. Warriner, Philadelphia, Pa.

COOPERATION (INTERNAL) REVENUE DEPARTMENT)

J. F. Callbreath, American Mining Congress, Munsey Bldg., Washington, D. C.
John T. Barnett, 1024 Lafayette St., Denver, Colo.
Paul Armitage, 2174, 233 Broadway, New York City.
L. C. Royle, Kansas City, Mo.
Rush C. Butler, Chicago, Ill.

COAL EXPORTS

Geo. S. Rice, Bureau of Mines, Washington, D. C.
John Callahan, Woodward Bldg., Washington, D. C.
Chas. A. Owen, Pres., Imperial Coal Corporation, 17 Battery Pl., New York City.
G. A. O'Reilly, Irving National Bank, New York City.

FEDERAL TAXATION

Paul Armitage, *Chairman*
233 Broadway, New York, N. Y.
Geo. E. Holmes, *Vice-Chairman*
15 William St., New York, N. Y
McK. W. Kriegh, *Secretary*
841 Munsey Building, Washington, D. C.

R. C. Allen, Hanna Building, Cleveland, Ohio.
A. Scott Thompson, Miami, Okla.
Wm. B. Gower, 20 Exchange Place, New York, N. Y.
R. V. Norris, 520 Second National Bank Bldg., Wilkes-Barre, Pa.
J. C. Dick, 1502 Walker Bank Bldg., Salt Lake City, Utah.
A. P. Ramstedt, Wallace, Idaho.
E. L. Doheny, 120 Broadway, New York City.
T. O. McGrath, Bisbee, Ariz
Robt. N. Miller, Southern Building, Washington, D. C.
H. B. Fernald, 54 Wall Street, New York City.

UNIFORM COAL MINE REPORTS

S. A. Taylor, Second National Bank Bldg., Pittsburgh, Pa.
Carl Scholz, Professional Building, Charleston, W. Va.
A. H. Land, Huntington, W. Va.
Morton L. Gould, 701 Terminal Bldg., Indianapolis, Ind.
G. H. Caperton, Box 601, Charleston, W. Va.
Thomas T. Brewster, St. Louis, Mo.

OPERATORS' CO-OPERATING COMMITTEE

PETROLEUM

J. G. Bradley, *Chairman*
J. F. Callbreath, *Secretary*

E. L. Doheny, Mexican Petroleum Co., 120 Broadway, New York City.
George S. Davidson, Gulf Refining Co., Pittsburgh, Pa.
A. L. Beaty, Texas Co., 17 Battery Pl., New York City.
H. F. Sinclair, Sinclair Oil Co., 45 Nassau St., New York City.
Walter Teagle, Standard Oil Co. of N. J., New York City.

METALS

Bulkeley Wells, Box 1619, Denver, Colo., Gold.
F. B. Richards, Leader-News Bldg., Cleveland, O., Iron.
Edgar Z. Wallower, Joplin, Mo., Zinc.
B. B. Thayer, 25 Broadway, New York City, Copper.

COAL

J. G. Bradley, Elk River Coal & Lumber Co., Dundon, W. Va.
T. H. Watkins, Pennsylvania Coal & Coke Corp., New York City.
E. W. Parker, Anthracite Bureau of Information, Philadelphia, Pa.
Albert Nason, Nason Coal Co., Chicago, Ill.
J. G. Puterbaugh, McAlester Fuel Co., McAlester, Okla.
S. D. Warriner, Lehigh Coal & Navigation Co., Philadelphia, Pa.

STANDARDIZATION DIVISION

Metal and Coal Branches

COAL MINING BRANCH

General Committee

Colonel Warren R. Roberts, *Chairman*, 1110 Wrigley Bldg., Chicago, Ill.
Chas. H. Matthews, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
C. E. Watts, Efficiency Engineer, Berwind-White Coal Mining Company, Windber, Pa.
A. B. Kiser, Electrical Engineer, Pittsburgh Coal Co., Pittsburgh, Pa.
C. H. Trik, Jeffrey Manufacturing Co., Columbus, Ohio.
Fred L. Stone, Power & Mining Engineering Dept., General Electric Co., Schenectady, N. Y.
D. J. Carroll, Chicago, Wilmington & Franklin Coal Co., Benton, Ill.
R. L. Adams, Chief Engr., Old Ben Coal Corp., Christopher, Ill.
James Needham, Genl. Mgr., St. Paul Coal Co., Chicago, Ill.

Underground Transportation

C. E. Watts, *Chairman*

MAIN COMMITTEE

C. E. Watts, (*Chairman*), Berwind White Coal Mining Co., Windber, Pa.
Frank S. Barks, President, Lincoln Steel and Forge Co., St. Louis, Mo.
Graham Bright, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Joseph Bryan, Salesman, General Electric Co., Pittsburgh, Pa.
F. C. Coseo, Jeffrey Mfg. Co., Columbus, Ohio.
A. H. Ehle, Genl. Sales Mgr., Baldwin Locomotive Works, Philadelphia, Pa.
W. J. Fene, Mining Engineer, U. S. Bureau of Mines, Washington, D. C.
R. J. Forester, Genl. Supt., Paradise Coal Co., Du Quoin, Ill.
J. B. Forrester, Chief Engineer, United States Fuel Co., Hiawatha, Utah.
D. F. Lepley, Genl. Mgr., Connellsville Mfg. and Supply Co., Connellsville, Pa.
J. D. Martin, General Superintendent of Coal Mines, Virginia Iron, Coal & Coke Co., Roanoke, Va.
Charles M. Means, Consulting Engineer, 447 Oliver Bldg., Pittsburgh, Pa.
J. Milliken, Pittsburgh Testing Laboratory, Pittsburgh, Pa.
Fred Norman, Chief Engineer, Allegheny River Mining Co., Kittanning, Pa.
T. A. Parker, Manager, Mine Car & Equipment Dept., St. Louis Structural Steel Co., St. Louis, Mo.
H. K. Porter, Eastern Division, Hyatt Roller Bearing Co., Harrison, N. J.
G. H. Shapter, Power and Equipment Dept., General Electric Co., Erie, Pa.
E. A. Watters, Genl. Supt., Hicks' Coal Companies, Leechburg, Pa.
John T. Cherry, Gen'l Supt., B. F. Berry Coal Co., Standard, Ill.

SUB-COMMITTEE NO. 1—COAL MINE CAR DESIGN

J. Milliken (*Chairman*), Pittsburgh Testing Laboratory, Pittsburgh, Pa.
C. E. Watts, Berwind White Coal Mining Co., Windber, Pa.
H. M. Estabrook, Standard Steel Car Co., Pittsburgh, Pa.
W. K. Hansen, Genl. Supt., Hockensmith Wheel and Mine Car Co., Penn, Pa.
R. L. Kingsland, Genl. Supt., Consolidation Coal Co., Fairmont, W. Va.
H. M. Motherwell, Philadelphia Electric Co., Philadelphia, Pa.
A. E. Ostrander, 165 Broadway, New York City.
C. K. Witmer, Master Mechanic, Westmoreland Coal Co., Irwin, Pa.
W. C. Sanders, Railway Equipment Engr., Timken Roller Bearing Co., Canton, Ohio.

SECTIONAL COMMITTEE ON TYPES OF HAND BRAKES

H. M. Motherwell (*Chairman*), Mechanical Engineer, U. S. Bureau of Mines, Pittsburgh, Pa.
T. G. Fear, Genl. Supt., Inland Collieries Co., Harmarville, Pa.
Wm. A. Hill, Chief Mine Inspector, Travelers Insurance Co., Pittsburgh, Pa.
A. A. Read, Mine Operator, 610 Park Bldg., Pittsburgh, Pa.
William H. Robinson, Supervising Mine Inspector, 208 Fulton Bldg., Pittsburgh, Pa.

SECTIONAL COMMITTEE OF MINE CAR WHEELS

C. K. Witmer (*Chairman*), Master Mechanic, Westmoreland Coal Co., Irwin, Pa.
W. E. Farrell, President, Easton Car and Construction Co., Easton, Pa.
John M. Lewis, Chief Engineer, Houston Coal and Coke Co., Cincinnati, Ohio.
Arthur Neale, Asst. Supt. of Mines, Pittsburgh Coal Co., Pittsburgh, Pa.
Cecil W. Smith, Chief Engineer, Nason Coal and Coke Co., Chicago, Ill.
W. G. Srodes, Superintendent, Shenango Furnace Co., Ligonier, Pa.

SUB-COMMITTEE NO. 2—MINE TRACKS AND SIGNALS

Fred Norman (*Chairman*), Chief Engineer, Allegheny River Mining Co., Kittanning, Pa.
William P. Buckwalter, Manager, Ironton Engine Co., Pittsburgh, Pa.
A. S. Carr, 622 Orchard St., Bellevue, Pa.
R. K. Cheney, Southern California Iron & Steel Co., Los Angeles, Calif.
R. G. Crawford, American Frog and Switch Co., Pittsburgh, Pa.
T. H. Edleblute, Edleblute Machinery Co., Pittsburgh, Pa.
R. L. Gillispie, Asst. Supt., Bethlehem Steel Co., Steelton, Pa.

OFFICERS AND COMMITTEES, 1924—(Continued)

F. C. Hohn, Trans. Engr., Hudson Coal Co., Scranton, Pa.
F. W. Holcomb, American Frog and Switch Co., Hamilton, Ohio.
William P. Jones, Chickasaw, Pa.
J. K. Landsdowne, Vice-President, Weir Frog Co., Cincinnati, Ohio.
Charles H. Partington, Chief Engineer, Cincinnati Frog & Switch Co., Cincinnati, Ohio.
W. H. Rubbe, Chief Engineer, American Frog & Switch Co., Hamilton, Ohio.
Charles C. Steel, General Sales Agent, Sweet Steel Co., Williamsport, Pa.
Thomas H. Thompson, Mine Inspector, Kittanning, Pa.
J. R. Ulrich, Bethlehem Steel Co., Bethlehem, Pa.
Arthur White, Seminole, Pa.
John Woodall, Conifer, Pa.
Wm. G. Hulbert, Supt., Wm. Wharton, Jr., & Co., Inc., Easton, Pa.

SUB-COMMITTEE NO. 3—MINE LOCOMOTIVE

Graham Bright (*Chairman*), Union Trust Bldg., Pittsburgh, Pa.
Joseph Bryan, Salesman, General Electric Co., Pittsburgh, Pa.
F. C. Coseo, Jeffrey Mfg. Co., Columbus, Ohio.
T. F. Downing, Jr., General Manager, Logan County Coal Corp., Lundale, W. Va.
A. H. Ehle, General Sales Manager, Baldwin Locomotive Works, Philadelphia, Pa.
S. W. Farnham, Goodman Mfg. Co., Chicago, Ill.
W. J. Fene, Mining Engineer, U. S. Bureau of Mines, Washington, D. C.
G. H. Shapter, General Electric Co., Erie, Pa.

Mining and Loading Equipment

D. J. Carroll, *Chairman*

Carl Scholz, General Manager, Raleigh-Wyoming Coal Co., Charleston, W. Va.
N. D. Levin, Jeffrey Manufacturing Co., Columbus, Ohio.
J. M. Clark, Clark & Krebs, Charleston, W. Va.
M. Mitchell, Sullivan Machinery Co., St. Louis, Mo.
William Whaley, Myers-Whaley Co., Knoxville, Tenn.
E. S. McKinlay, 484 Bourse Bldg., Philadelphia, Pa.
William E. Hamilton, 310 Schultz Bldg., Columbus, Ohio.
Walter Stevens, Valier Coal Co., Valier, Ill.
S. W. Farnham, Mining Engineer, Goodman Mfg. Co., Chicago, Ill.
E. K. Bowers, Morgan-Gardner Electric Co., 2640 Shields Avenue, Chicago, Ill.
Edward H. Coxe, Snowdon Coke Co., Brownsville, Pa.
Newell G. Alford, Union Trust Bldg., Pittsburgh, Pa.
Walter Calverley, President, Fayette Coal Corp., Pittsburgh, Pa.
F. W. Whiteside, Victor-American Fuel Co., Denver, Colo.
G. T. Haldeman, U. S. Bureau of Mines, Washington, D. C.
G. W. Hay, General Manager, Consolidation Coal Co., Jenkins, Ky.
A. P. Cameron, General Manager, Westmoreland Coal Co., Irwin, Pa.
J. F. Joy, President, Joy Machine Co., Pittsburgh, Pa.
Charles Gottschalk, Mining Engineer, Evansville, Ind.

Mine Drainage

Charles H. Matthews, *Chairman*

SUB-COMMITTEE NO. 1—PUMPS FOR DEVELOPMENT WORK

L. W. Householder (*Chairman*), Rochester & Pittsburgh Coal & Iron Co., Indiana, Pa.
E. F. Austin, Dravo-Doyle Co., Pittsburgh, Pa.
Herbert Axford, Ingersoll-Rand Company, Scranton, Pa.
Harold P. Dyer, General Manager, Vandalia Coal Co., Sullivan, Indiana.
J. H. Edwards, Electrical Engineer, Elkhorn Piney Coal Mining Co., Huntington, W. Va.
F. J. Emeny, Chief Engineer, Deming Co., Salem, Ohio.
J. E. Holveck, Aldrich Pump Co., Keenan Bldg., Pittsburgh, Pa.
H. E. Huttle, Mechanical Engineer, H. C. Frick Coke Co., Scottdale, Pa.
H. J. Nelms, Genl. Supt. of New Field By-Products Coal Co., North Bessemer, Pa.
J. S. O'Flaherty, Chief Engineer, Central Coal & Coke Co., Kansas City, Mo.
F. W. Smith, Mine Drainage Engineer, Weinman Pump and Supply Co., Pittsburgh, Pa.

SUB-COMMITTEE NO. 2—PERMANENT PUMPING STATIONS

Herbert Axford (*Chairman*), Ingersoll-Rand Co., Scranton, Pa.
Henry E. Cole, Harris Pump & Supply Co., Pittsburgh, Pa.
J. P. Heidenreich, Scranton Pump Co., Scranton, Pa.
R. F. Roth, C. E., E. E. White Coal Co., Glen White, W. Va.
Cecil W. Smith, Nokomis Coal Co., Chicago, Ill.
M. Spillman, Works Engineer, Worthington Pump & Machinery Corp., Harrison, N. J.
L. D. Tracy, Supt., U. S. Bureau of Mines, Urbana, Illinois.
W. L. Robinson, Vice President, Youghiogheny & Ohio Coal Co., Cleveland, Ohio.

SUB-COMMITTEE NO. 3—NATURAL DRAINAGE

John Brunschwyler (*Chairman*), Chief Engineer, Paint Creek Coal Mining Co., Gallagher, W. Va.
M. C. Benedict, Consulting Engineer, 447 W. Chestnut St., Lancaster, Pa.
Oscar Cartlidge, 1593 Lee St., Charleston, W. Va.
L. P. Crecelius, Engineer, Cleveland & Western Coal Co., Cleveland, Ohio.
E. D. Knight, 2207 Washington St., Charleston, W. Va.
R. Y. Wert, Mine Drainage Supt., Durham Coal & Iron Co., Soddy, Tenn.

SUB-COMMITTEE NO. 4—UNWATERING ABANDONED WORKINGS

Prof. John W. Hallock (*Chairman*), University of Pittsburgh, Pittsburgh, Pa.
H. E. Huttle, Mechanical Engineer, H. C. Frick Coke Company, Scottdale, Pa.
J. A. Malady, Hillman Coal & Coke Co., Pittsburgh, Pa.
O. M. Pruitt, President, Indiana Air Pump Co., Indianapolis, Ind.
Charles Straw, Hudson Coal Co., Scranton, Pa.
G. V. Woody, Allis-Chalmers Mfg. Co., Wilkes-Barre, Pa.

SUB-COMMITTEE NO. 5—MINE WATER AND ITS ACTION UPON MINE DRAINAGE EQUIPMENT

George A. Drysdale (*Chairman*), Editor, Foundry, Cleveland, Ohio.
J. R. Campbell, Chief Chemist, H. C. Frick Coke Co., Everson, Pa.
George Watkin Evans, Consulting Coal Mining Engineer, L. C. Smith Bldg., Seattle, Wash.
Carl J. Fletcher, Vice-President, Knox Coal Mining Co., Indianapolis, Ind.
C. L. Harrod, Electrical Engineer, Indiana Coal Operators' Power Association, Indianapolis, Ind.
Martin J. Lide, Consulting Engineer, Woodward Bldg., Birmingham, Ala.
Frank G. Morris, Genl. Supt. of Mines, Republic Iron & Steel Co., Sayreton, Ala.
J. S. O'Flaherty, Chief Engineer, Central Coal and Coke Co., Kansas City, Mo.
D. H. Parker, Genl. Supt., Clarkson Coal Mining Co., St. Claireville, Ohio.
L. D. Rover, Power and Construction Dept., Ford Motor Co., Detroit, Mich.

Mine Ventilation

C. H. Trik, *Chairman*

SUB-COMMITTEE NO. 1—AIR SHAFTS AND AIR WAYS

J. C. Gaskill (*Chairman*), Asst. Cons. Engr., Consolidation Coal Co., Fairmont, W. Va.
O. H. Beidenmiller, Manager, Glogora Coal Co., Huntington, W. Va.
J. H. Doughty, Mechanical Engineer, Lehigh and Wilkes-Barre Coal Co., Wilkes-Barre, Pa.
Robert Wallace, Supt., Pocahontas Fuel Co., Inc. Pocahontas, Va.
J. Walsh, Harrisburg, Penna.

SUB-COMMITTEE NO. 2—MINE FAN INSTALLATION

G. E. Lyman (*Chairman*) General Supt., Madison Coal Corp., Glen Carbon, Ill.
H. G. Conrad, General Manager, American Coal Mining Co., Bicknell, Ind.
R. B. Fleming, Evansburg Coal Co., Colver, Pa.
E. B. Wagner, Lehigh Valley Coal Co., Wilkes-Barre, Pa.

SUB-COMMITTEE NO. 3—BOOSTER FANS

R. Dawson Hall (*Chairman*), Editor, Coal Age, 10th Ave. at 36th St., New York City.
Howard N. Eavenson, Mining Engineer, Union Trust Bldg., Pittsburgh, Pa.
R. H. Moore, C. A. Hughes & Co., Portage, Pa.
E. N. Zern, Mining Engineer and Editor, Mining Catalog, Pittsburgh, Pa.

SUB-COMMITTEE NO. 4—MINE ATMOSPHERE

Thomas Chester (*Chairman*), American Blower Co., Detroit, Mich.
Martin J. Lide, Woodward Bldg., Birmingham, Ala.
R. M. Perry, Genl. Supt., Moffat Coal Co., Denver, Colo.
C. E. Sharpless, Engineer, Ebensburg Coal Co., Ebensburg, Pa.
H. B. Wright, Chief Engineer, Pocahontas Fuel Co., Inc., Pocahontas, Va.

Outside Coal Handling Equipment

James Needham, *Chairman*

F. W. Whiteside, Chief Engineer, Victor American Fuel Co., Denver, Colo.
C. Law Watkins, Pennsylvania Coal & Coke Corp., Cresson, Pa.
W. G. Duncan, Jr., Supt., W. G. Duncan Coal Co., Inc., Greenville, Ky.
H. H. Elkins, Elm Grove Mining Co. of Ohio, Lafferty, O.
H. F. Nash, Oakdale Coal Co., Denver, Colo.
John J. Moore, Thomas Elevator Co., Chicago.
M. A. Kendall, Chief Engineer, Stephens-Adamson Mfg. Co., Aurora, Ill.
Warren R. Roberts, Wrigley Building, Chicago, Ill.
Rudolph H. Kudlich, Asst. to Chief Mechanical Engineer, U. S. Bureau of Mines, Washington, D. C.
Hubb Bell, Hotel Senton, 35 E. 27th St., New York City.
J. W. Bischoff, West Virginia Coal & Coke Co., Elkins, W. Va.
George H. Morse, Genl. Supt., Republic Iron & Steel Co., Oliver Bldg., Pittsburgh, Pa.
H. D. Smith, Genl. Supt., American Coal Company of Alleghany County, McComas, W. Va.
C. R. Stahl, E. E. White Coal Co., Stotesbury, W. Va.
F. G. Morris, Republic Iron & Steel Co., Sayreton, Ala.

Underground Power Transmission

A. B. Kiser, *Chairman*

Harry M. Warren, Consulting Engineer, Glen Alden Coal Co., Scranton, Pa.
W. A. Chandler, care of Hudson Coal Co., Scranton, Pa.
R. L. Kingsland, Genl. Supt., P. & M. Dept., Consolidated Coal Co., Fairmont, W. Va.
Carl Lee, Electrical Engineer, Peabody Coal Co., McCormick Bldg., Chicago, Ill.
L. C. Ilsley, 4800 Forbes St., Pittsburgh, Pa. (Bureau of Mines.)
H. G. Conrad, American Mining Co., Bicknell, Ind.
Wm. Schott, Consulting Engineer, Big Creek Coal Co., Chicago, Ill.

Power Equipment

F. L. Stone, *Chairman*

D. C. McKeeham, Box 913, Union Pacific Coal Co., Rock Springs, Wyo.
G. S. Thompson, Colorado Fuel & Iron Co., Pueblo, Colo.
H. F. Randolph, Consulting Engineer, 2330 Oliver Bldg., Pittsburgh, Pa.
M. D. Kirk, Pittsburgh Terminal R. R. Coal Co., Wabash Bldg., Pittsburgh, Pa.
R. W. E. Moore, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
R. L. Kingsland, Consolidated Coal Co., Fairmont, W. Va.
W. C. Shunk, Stonega Coal & Coke Co., Big Stone Gap, Va.
J. T. Jennings, Philadelphia & Reading Coal & Iron Co., Pottsville, Pa.
W. C. Adams, with Allen & Garcia, Chicago, Ill.
O. P. Hood, Chief Mechanical Engineer, Bureau of Mines, Washington, D. C.
Graham Bright, Union Trust Bldg., Pittsburgh, Pa.
A. J. Nicht, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Stephen H. Green, Pacific Coast Coal Co., Seattle, Wash.
Charles Legrand, Phelps Dodge Corp., Douglas, Ariz.
Martin J. Lide, Consulting Engineer, Woodward Bldg., Birmingham, Ala.
C. D. Woodward, Chief Electrical Engineer, Anaconda Copper Mining Co., Butte, Mont.
J. A. Malady, Hillman Coal & Coke Co., Pittsburgh, Pa.

Committee on Mine Timbering

R. L. Adams, Chairman,

SUB-COMMITTEE NO. 1—GENERAL MINE TIMBERING. SIMPLIFICATION ON GRADES AND NAMES.

J. R. Sharp (*Chairman*), Genl. Supt., Shoal Creek Coal Co., Illinois Merchants Bank Bldg., Chicago, Ill.
Charles N. Perrin, National Hardwood Lumber Association, Buffalo, N. Y.
George T. Stevens, Chief Engineer, Clinchfield Coal Corp., Dante, Va.
Dudley F. Holtman, Const. Engr., National Lumber Mfgrs. Assn., 402 Transportation Bldg., Washington, D. C.
J. R. Crowe, Jr., President, Crowe Coal Co., Kansas City, Mo.
George S. Rice, Chief Mining Engineer, U. S. Bureau of Mines, Washington, D. C.
Ernest M. Merrill, 1402 Kanawha St., Charleston, W. Va.
R. W. Austin, Chief Engineer, Empire Coal Mining Co., Clearfield, Pa.
N. A. Barnhart, Purchasing Agent, Bertha Coal Co., Pittsburgh, Pa.
G. A. Knox, General Manager, Gunn-Quealey Coal Co., Gunn, Wyoming.
Newell G. Alford, Union Trust Bldg., Pittsburgh, Pa.

SUB-COMMITTEE NO. 2—PRESERVATION OF MINE TIMBERS

George M. Hunt (*Chairman*), Forest Products Laboratory, Madison, Wis.
W. F. Affelder, Asst. to Pres., Hillman Coal and Coke Co., Pittsburgh, Pa.
R. W. Austin, Chief Engineer, Empire Coal Mining Co., Clearfield, Pa.
D. A. Stout, Manager, Fuel Department, Colorado Fuel and Iron Co., Pueblo, Colo.

SUB-COMMITTEE NO. 3—USE OF CONCRETE IN MINE TIMBERING

B. C. Collier (*Chairman*), President, Cement Gun Co., Inc., Allentown, Pa.

OFFICERS AND COMMITTEES, 1924—(Continued)

A. C. Irwin, Structural Engineer, Portland Cement Association, Chicago, Ill.
W. R. Peck, Chief Engineer, Black Diamond Collieries Co., Coal Creek, Tenn.

SUB-COMMITTEE NO. 4—USE OF STRUCTURAL STEEL FOR MINE TIMBERING

(Personnel not appointed.)

SUB-COMMITTEE NO. 5—SALVAGE OF MINE TIMBERS.

George T. Stevens (*Chairman*), Chief Engineer, Clinchfield Coal Corp., Dante, Va.

METAL MINING BRANCH

General Committee

Charles A. Mitke, Phoenix, Ariz., *Chairman*
William B. Daly, Genl. Mgr. of Mines, Anaconda Copper Company, Butte, Mont.
William Conibear, Inspector, Dept. of Safety, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
H. C. Goodrich, 1408 Deseret Bank Bldg., Salt Lake City, Utah.
Wm. H. Gallagher, Jr., Chief Mech. Engr., Pickands, Mather & Co., Duluth, Minn.
Lucien Eaton, Superintendent, Ishpeming District, Cleveland-Cliffs Iron Company, Ishpeming, Mich.
T. O. McGrath, Shattuck Arizona Mining Co., Bisbee, Ariz.
Philip D. Wilson, Calumet & Arizona Mining Co., Warren, Ariz.
H. G. S. Anderson, Rolla, Mo.
Chas. A. Smith, Mine Supt., Ray Cons. Copper Co., Ray, Ariz.
Dr. Frank H. Probert, Dean, College of Mining, University of California, Berkeley, California.

Mine Drainage

Wm. H. Gallagher, Jr., *Chairman*

C. Mendelsohn, Master Mechanic, Old Dominion Co., Globe, Ariz.
W. N. Tanner, Mech Engr., Anaconda Copper Co., Butte, Mont.
O D. McClure, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
G. L. Kollberg, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
H. T. Abrams, Ingersoll-Rand Co., New York City.

Drilling Machines and Drill Steel

Charles A. Smith, *Chairman*

SUB-COMMITTEE NO. 1—DRILLING MACHINES

B. F. Tillson (*Chairman*), Asst. Supt., New Jersey Zinc Co., Franklin, N. J.
Arthur B. Foote, North Star Mines, Grass Valley, Calif.
L. C. Bayles, Chief Engineer, Ingersoll-Rand Co., Phillipsburg, N. J.
R. T. Murrill, Safety and Efficiency Engineer, Inspiration Cons. Copper Co., Inspiration, Ariz.
Roy Marks, Stope Engineer, United Verde Extension Mining Co., Jerome, Ariz.
W. G. Scott, Morenci Branch, Phelps-Dodge Corp., Metcalf, Ariz.
R. A. Scott, Sales Manager, Denver Rock Drill Co., Denver, Colo.
H. T. Walsh, Vice-President, Sullivan Machinery Co., Chicago, Ill.
J. A. Fulton, Idaho-Maryland Mines Co., Grass Valley, California.

SUB-COMMITTEE NO. 2—DRILL STEEL

Frank Ayer (*Chairman*), Genl. Supt., Moctezuma Copper Co., Nacozari, Sonora, Mexico.
Ocha Potter, Supt., Superior Division, Calumet and Hecla Mining Co., Houghton, Mich.
A. S. Uhler, Ingersoll-Rand Co., New York City.
Charles Officer, Sullivan Machinery Co., Chicago, Ill.
Bruce Yates, Genl. Mgr., Homestake Mining Co., Lead, S. Dak.
O. J. Egleston, Mgr., U. S. Smelting, Refining & Mining Co., Kennett, Calif.
C. S. Elayer, Cloudcroft, N. M.
E. G. Deane, Manager, Superior and Boston Copper Co., Copper Hill, Ariz.
Norman B. Braly, Genl. Mgr., North Butte Mining Co., Butte, Mont.
Charles S. Hurter, Technical Representative, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
M. van Siclen, U. S. Bureau of Mines, Washington, D. C.
Earl F. Hastings, care Ingersoll-Rand Co., Mexico City, Mex.

SUB-COMMITTEE NO. 3—METHODS OF SHARPENING DRILL STEEL

George H. Gilman, 125 Prescott St., East Boston, Mass.
Arthur Notman, Consulting Engineer, 170 Broadway, New York City.
H. Seamon, Efficiency Engineer, Fresnillo Branch, Mexican Corp., Fresnillo, Zacatecas, Mexico.
Charles Lees, Supt., Iron Cap Copper Co., Copper Hill, Ariz.
Frank W. McLean, Underground Foreman, United Verde Ex. Mining Co., Jerome, Ariz.
W. H. Schacht, Genl. Mgr., Copper Range Co., Painesdale, Mich.

Underground Transportation

William B. Daly, *Chairman*

George H. Booth, Mechanical Engineer, Inspiration Cons. Copper Co., Inspiration, Ariz.
Andover Syverson, Prescott, Ariz.
E. M. Norris, Asst. Supt. of Mines, Anaconda Copper Mining Co., Butte, Mont.
R. R. Boyd, Asst. Superintendent, Mine Dept., Copper Mining Branch, Phelps-Dodge Corp., Bisbee, Ariz.
T. K. Scott, Chief Engineer, Box 100, Miami Copper Co., Miami, Ariz.
H. T. Hamilton, Manager, Moctezuma Copper Co., Nacozari, Sonora, Mexico.
R. E. Howe, Asst. General Manager, Cananea Cons. Copper Co., Cananea, Sonora, Mexico.
D. S. Calland, Managing Director, Companie de Real del Monte de Pachuca, Pachuca, Hidalgo, Mexico.
Robt. H. Dickson, Chief Engineer, Calumet & Arizona Mining Co., Warren, Ariz.
Stanley A. Easton, Kellogg, Idaho.
John Kiddie, Arizona Copper Co., Morenci, Ariz.
C. E. Lantz, Genl. Mgr., Cia de Santa Gertrudis, Pachuca, Mexico.
W. R. Crane, U. S. Bureau of Mines, Birmingham, Ala.
Thomas C. Baker, Fresnillo Unit, The Mexican Corp., Fresnillo, Zacatecas, Mexico.
W. V. DeCamp, Mine Supt., United Verde Copper Co., Jerome, Ariz.
F. H. Hayes, Mine Supt., Copper Queen Branch, Phelps-Dodge Corp., Bisbee, Ariz.

Fire Fighting Equipment

William Conibear, *Chairman*

SUB-COMMITTEE NO. 1—CONTROL OF VENTILATING EQUIPMENT DURING MINE FIRES

Orr Woodburn (*Chairman*), Safety Engineer, Globe-Miami District, Globe, Ariz.
Guy J. Johnson, Homestake Mining Co., Lead, S. Dak.
J. T. Young, Safety Inspector, Arizona Copper Co., Morenci, Ariz.
H. J. Rahilly, Supt., Mine Fire & Hydraulic Filling Dept., Anaconda Copper Mng. Co., Butte, Mont.
Albert Fallon, Safety Inspector, Old Dominion Co., Globe, Ariz.

SUB-COMMITTEE NO. 2—FIRE HOSE

R. H. Seip (*Chairman*), New Jersey Zinc Co., Franklin, N. J.
C. W. Moon, Safety Inspector, Phelps-Dodge Corp., Bisbee, Ariz.
Byron O. Pickard, District Mining Engineer, U. S. Bureau of Mines, Berkeley, Calif.

MINE EXCAVATING EQUIPMENT—Exclusive of "DREDGES"

H. C. Goodrich, *Chairman*

Robert E. Tally, Asst. Genl. Mgr., United Verde Copper Company, Clarkdale, Ariz.
G. W. Barnhart, Ricker Machinery Co., San Francisco, Calif.
C. B. Lakenan, General Manager, Nevada Cons. Copper Co., McGill, Nev.
H. G. S. Anderson, Mining and Metallurgical Engineer, Rolla, Mo.
T. A. Snyder, Bucyrus Co., Milwaukee, Wis.
George Mieyr, Phelps-Dodge Corp., Bisbee, Ariz.
M. Curley, Gnl Supt, New Cornelia Copper Co., Ajo, Ariz.
H. C. Bellinger, Vice-President, Chile Exploration Co., 120 Broadway, New York, N. Y.
H. T. Gracely, care Marion Steam Shovel Co., Marion, Ohio.
W. J. Lester, President, Kentucky Washed Coal Company, Greenville, Ky.
G. A. Murfey, care The Browning Co., Cleveland, Ohio.
H. B. Oatley, Vice-President, The Superheater Company, 17 East 42nd St., New York, N. Y.
J. C. Wheat, Engineering Dept., Industrial Works, Bay City, Mich.
C. S. Whitaker, care Winston Brothers, Minneapolis, Minn.

Mine Ventilation

Charles A. Mitke, *Chairman* (Temporary)

A. C. Stoddard, Chief Engineer, Inspiration Cons. Copper Co., Box 15, Inspiration, Ariz.
D. Harrington, care Bureau of Mines, Denver, Colo.
W. A. Rowe, Chief Engineer, American Blower Co., Detroit, Mich.
E. B. Williams, Manager, Mine Fan Dept., B. F. Sturtevant Company, Hyde Park, Boston, Mass.
Robert N. Bell Cons. Mining Engineer, Boise, Idaho.
F. L. Stone, care General Electric Co., Schenectady, N. Y.
C. E. Legrand, Consulting Engineer, Phelps-Dodge Corp., Douglas, Ariz.
O. K. Dyer, Buffalo Forge Company, Buffalo, N. Y.
Don M. Rait, Asst. Superintendent of Mines, Calumet and Arizona Mining Co., Warren, Ariz.
A. S. Richardson, Chief of Ventilating Department, Anaconda Copper Mining Co., Drawer 1375, Butte, Mont.
Walter C. Browning, Magna Copper Company, Superior, Ariz.
F. W. MacLennan, Genl. Mgr., Miami Copper Co., Miami, Ariz.
E. T. Lednum, Mgr., E. I. Du Pont de Nemours Co., Inc., Ideal Bldg., Denver, Colo.

Mechanical Loading Underground

Lucien Eaton, *Chairman*

SUB-COMMITTE NO. 1—LOADING MACHINES FOR TUNNELS, LARGE DRIFTS AND STOPES.

Douglas C. Corner (*Chairman*), Mining Engineer, 1004 Federal Reserve Bank Bldg., St. Louis, Mo.
H. E. Billington, Manager of Sales, The Thew Shovel Co., Lorain, Ohio.
J. H. Hensley, Mine Supt., Miami Copper Co., Miami, Ariz.
H. DeWitt Smith, Supt. of Mines, United Verde Copper Co., Jerome, Ariz.
H. G. Washburn, Flat River, Mo.
William Whaley, Genl. Mgr., Myers-Whaley Co. Knoxville, Tenn.

SUB-COMMITTEE NO. 2—LOADING MACHINES FOR SMALL DRIFTS AND FOR WORK ON SUB-LEVELS

G. R. Jackson (*Chairman*), Supt., Cleveland-Cliffs Iron Co., Negaunee, Mich.
C. L. Berrien, Anaconda Copper Mining Co., Butte, Montana.
Henry Talboys, Sales Manager, Lake Superior Loader Co., Duluth, Minn.
Charles E. Van Barneveld, U. S. Bureau of Mines, St. Louis, Mo.

SUB-COMMITTEE NO. 3—SCRAPERS

Lucien Eaton (*Chairman*), Supt., Ishpeming District, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
C. L. Kohlhaas, Denver Rock Drill Co., Duluth, Minn.
Ward Royce, Ingersoll-Rand Co., Houghton, Mich.
E. E. Whiteley, Genl. Supt. of Mines, Calumet and Arizona Mining Co., Warren, Ariz.

Mine Timbering

Frank H. Probert, *Chairman*

SUB-COMMITTEE NO. 1—PRESERVATION OF MINE TIMBERS

George M. Hunt (*Chairman*), Forest Products Laboratory, Madison, Wis.
Gerald Sherman, Cons. Engr., Phelps Dodge Corpn., Douglas, Arizona.

SUB-COMMITTE NO. 2—GUNITE AS A SUBSTITUTE FOR TIMBER, ITS PROPER APPLICATIONS AND ITS LIMITATIONS.

E. M. Norris (*Chairman*), Asst. Genl. Supt of Mines, Anaconda Cppper Co., Butte, Mont.
B. C. Collier, President, Cement-Gun Co., Allentown, Pa.
R. R. Horner, Cons. Engr., U. S. Bureau of Mines, Clarksburg, W. Va.

SUB-COMMITTEE NO. 3—DETERMINATION OF SIZE AND SHAPE OF DRIFTS AND DRIFT TIMBERS FOR VARIOUS PURPOSES, WITH A VIEW TO REDUCING SAME TO CERTAIN STANDARD SIZES AND SHAPES.

Prof. F. W. Sperr, *Chairman*, Michigan College of Mines, Houghton, Mich.
Felix McDonald, Mines Supt., Inspiration Cons. Copper Co., Inspiration, Ariz.
Ira Joralemon, Cons. Engr., 1402 California Commercial Union Bldg., San Francisco, Calif.
C. L. Berrien, Genl. Supt., Anaconda Copper Co., Butte, Mont.

SUB-COMMITTEE NO. 4—COOPERATION BETWEEN OPERATORS AND LUMBER DEALERS AND MANUFACTURERS, WITH A VIEW TO ASCERTAINING WHETHER FURTHER STANDARDIZATION IN SIZES AND SHAPES OF LUMBER UNDERGROUND WOULD RESULT IN A REDUCTION IN COST TO MINING COMPANIES.

C F. Willis (*Chairman*), Editor, Arizona Mining Journal, Phoenix, Ariz.
W. S. Boyd, Manager, Ray Cons. Copper Co., Ray, Ariz.
W. G. McBride, Genl. Mgr., Old Dominion Co., Globe, Ariz.
G. R. Jackson, Supt., Negaunee Mine, Cleveland-Cliffs Iron Co., Negaunee, Mich.
Dudley F. Holtman, Construction Engr., National Lumber Mfgrs. Assn., Washington, D. C.
John Kiddie, Div. Supt., Arizona Copper Co., Morenci, Ariz.
T. Evans, Genl. Supt., Cananea Cons. Copper Co., Cananea, Sonora, Mex.

Mine Accounting

T. O. McGrath, *Chairman*

L. S. Cates, General Mgr., Utah Copper Co., Salt Lake City, Utah.
J. C. Dick, 1502 Walker Bank Bldg., Salt Lake City, Utah.
H. H. Miller, General Auditor, Hercules Mining Co., Wallace, Idaho.
H L. Norton, Phelps-Dodge Corporation, Douglas, Ariz.
Harry Vivian, Chief Engineer, Calumet and Hecla Mining Co., Calumet, Mich.
L. K. Diffenderfer, Treasurer, Vanadium Corp., 120 Broadway, New York City.
George Young, Cananea, Sonora, Mexico.
H. B. Fernald, 54 Wall St., New York City

OFFICERS AND COMMITTEES, 1924—(Continued)

Milling & Smelting Practices and Equipment
H. G. S. Anderson, *Chairman*

SUB-COMMITTEE NO. 1—MILLING PRACTICES AND EQUIPMENT

Arthur Crowfoot (*Chairman*), Mill Supt., Phelps-Dodge Corp., Morenci, Ariz.
Herman C. Bellinger, Vice-President, Chile Exploration Co., 120 Broadway, New York City.
G. R. Delamater, Engr., W. S. Tyler Co., Cleveland, O.
Allan J. Clark, Supt. of Mills, Homestake Mining Co., Lead, S. Dak.
W. M. Drury, Gnl. Mgr., American Smelting & Refining Co., El Paso, Texas.
Guy R. Ruggles, Supt. of Mills, Inspiration Cons. Copper Co., Inspiration, Ariz.
Henry A. Tobelman, 138 Halsey St., Brooklyn, N. Y.
William Young Westervelt, Cons. Mining Engr., 522 Fifth Ave., New York City.

SUB-COMMITTEE NO. 2—SMELTING PRACTICES AND EQUIPMENT

J. O. Ambler, Smelter Supt., Phelps-Dodge Corp., Clifton, Ariz.
P. P. Butler, Smelter Supt., Phelps-Dodge Corp., Douglas, Ariz.
Harry A. Clark, Smelter Supt., Calumet and Arizona Mining Co., Douglas, Ariz.
Kuno Doerr, Cons. Kansas City Smelting & Refining Co., El Paso Smelting Works, El Paso, Texas.
F. L. Flynn, Toltec Club, El Paso, Texas.
Prof. Carle R. Hayward, Associate Professor of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.
G. W. Prince, Smelter Supt., United Verde Extension Mining Co., Clemenceau, Ariz.

Methods of Mine Sampling
Phillip D. Wilson, *Chairman*

Guy Bjorge, 788 Mills Bldg., San Francisco, Calif.
E. L. Derby, Geologist, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
L. C. Graton, Professor of Geology, Harvard University, Cambridge, Mass.
MacHenry Mosier, Geologist, Clifton-Morenci Br., Phelps-Dodge Corp., Morenci, Ariz.
F. A. Linforth, Geological Dept., Anaconda Copper Mining Co., Butte, Mont.
Louis Reber, Chief Geologist, United Verde Copper Co., Jerome, Ariz.
J. B. Tenney, Geologist, Copper Queen Branch, Phelps-Dodge Corp., Bisbee, Ariz.
Morton Webber, 165 Broadway, New York City.
T. Skewes Saunders, Cons. Mining Engineer, La-Mutua, 525, Mexico, D. F.
M. J. Elsing, Cons. Engr., Bisbee, Ariz.
J. Kruttschnitt, Jr., American Smelting & Refining Co., Tucson, Ariz.
Albert Mendelsohn, Champion Copper Co., Painesdale, Mich.
R. W. Thomas, Ray Cons. Copper Co., Ray, Ariz.
H. A. C. Jenison, Geologist in Charge of Copper, U. S. Geological Survey, Washington, D. C.

Joint Publicity Committee

Representing Coal Mining Branch:

Ralph Becker, Keystone Cons. Publishing Co., Pittsburgh, Pa.
C. H. Trik, Jeffrey Mfg. Co., Columbus, Ohio.
Representing Metal Mining Branch:
Chas. F. Willis, Phoenix, Ariz.
T. O. McGrath, Bisbee, Ariz.

INDEX TO ADVERTISERS

Allis-Chalmers Mfg. Co. 8
Ameling Prospecting Co., H. R. 27
American Cyanamid Co. 4
American Mine Door Co. 21
American Steel & Wire Co. 6
American Zinc, Lead & Smelting Co. 14
Atlas Powder Co. 10
Aurora Pump & Mfg. Co. 23
Bertha-Consumers Co. 29
Boyle, John 29
Connellsville Mfg. and Mine Supply Co. 12
Du Pont de Nemours & Co., E. I. 13
General Coal Co. 27
Goodman Mfg. Co. 9
Greene, Tweed and Co. 7
Hoffman Brothers 26
Hunt Company, Robert W. 27
Hyatt Roller Bearing Co. ..... Inside Front Cover
Ingersoll-Rand Co. 11
Irvington Smelting & Refining Works 29
Jeffrey Mfg. Co. ..... Back Cover
Jones Fdry. & Machine Company, W. A. 12
Joy Machine Co. 18
Lehigh Coal & Navigation Co. 29
Lidgerwood Mfg. Co. 6
Lunkenheimer Co. 23
Mining Safety Device Co. 10
Morse Chain Co. 3
New York Engineering Co. 27
Ohio Brass Co. 21
Phelps Dodge Corp. 29
Prest-O-Lite Products Co. 19
Roebling's Sons Co., John A. 22
Roessler & Hasslacher Chemical Co. 12
Stine Company, J. C. 21
Stonehouse Signs, Inc. 26
Streeter-Amet Weighing & Recording Co. 8
Sweet's Steel Co. 21
Thorne, Neal & Co. 14
Timken Roller Bearing Co. 15
West Virginia Rail Co. 23
Wilmot Engineering Co. 27
Wolf Safety Lamp Co. of America, Inc. 23

The TRIP

Through the scenic splendors of the Rockies, stopping en route at important mining centers, with the privilege of several weeks in California; many special side trips through historic and beautiful parts of the state arranged for as entertainment; and for little additional, the privilege of return via Portland, Tacoma, Seattle, or Vancouver, B. C. All this

plus

an opportunity to take part in this year's important program at the convention of the American Mining Congress and assist in the formation of a National Mining platform. Taxation, Mine Finance, Gold Production, Silver Production, Governmental Paternalism, the Progress of Industrial Cooperation and of Standardization of Equipment and Practice, Oil Shale Developments, Imminent Tariff Questions: these are the most important questions to be considered at the 27th Annual Convention of the American Mining Congress at Sacramento and constitute

its PURPOSE

The State Capitol building at Sacramento where the convention will be held.

Send for a copy of booklet "Hit the Gold Trail to Sacramento." 851 Munsey Bldg. Washington, D. C.